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Editorial.

Fruit. The necessity for the inclusion in an increasing measure of fruits in our diet, is being emphasised of late, by food experts and reformers. The importance of fruits as sources of vitamins for preserving one in health and efficiency is being recognised and yet very little of fruit is eaten by the masses in South India.

The most common fruit available throughout the year and one which is fairly cheap is the banana or the plantain. This fruit, however, is rather difficult to digest except when fully ripe, and it contains very little vitamins, its usefulness being due only to the large amount of sugars and starches it contains. The mango is procurable only at certain seasons and some of the better and more nourishing varieties are beyond the pockets of the poorer classes. In the same category as the mango, will be the orange, several varieties of which are cultivated, including those which are eaten as fruit, like the loose jacket, the batavians and the *sathgudhi* and those which are used for pickling, like the country oranges. The value of the orange has been recognised even in Indian medicine, and it is said, that the practice of a wellknown medical practitioner in Rajahmundry who successfully prescribed orange juice for most ailments has been responsible for stimulating the extension of the area under the local indigenous orange. One can now see on either side of the Kistna canal, several acres of dry lands planted with the country orange.

It is not surprising therefore, that the demand for fresh fruits in India, as a whole has been increasing, as evidenced by the fact that the aggregate value of fresh fruits and vegetables imported into the country during 1933-34 amounted to over 28 lakhs and that in 1932-33 fruits, inclusive of almonds and dates, of a total value of 1.17 crores of rupees, were imported. It must not be forgotten however, that this increasing import reflects more the demand from the wealthier classes, and the poorer classes have not yet taken to fruit as an important item of their diet. While the necessity for a lot of propaganda work by both the Public Health and the Agricultural Departments is thus indicated, much headway cannot be made, unless attempts are made to raise the standard of living. Besides, if the campaign of "eat more fruit" is to succeed, more fruits must be produced within the country and at a cheap cost.

That the Government of the country is alive to the need for improving the fruit industry is evidenced from the large number of grants made by the Imperial Council of Agricultural Research for different schemes of fruit research in the various provinces. Almost every province has now got a scheme either already working or awaiting the provision of funds to start work.

There has been a general awakening all over the world and practically every country outside India is trying to improve or develop her fruit industry. Some of our neighbours like Malaya and Ceylon are now taking an active interest in fruit growing. While every country which has not got an adequate and established fruit industry is attempting to create one, those where the industry is already well developed are out to capture fresh markets or augment already existing markets for their produce. So far as India is concerned, the imports of fruits come both from Empire and Non-Empire countries. During 1933-34 the British Empire supplied 2.73 lakhs of rupees worth of fruits while from outside the British Empire the imports were nearly 6 lakhs worth, the main exporting countries being Japan which sends a large quantity of apples and the U. S. A. which sends both apples and oranges. The market for Japanese fruit in India is of a recent origin and is definitely getting bigger every year.

There is at present in India a trade delegation from Australia studying the question of markets for some of their products. It is stated that India has a very favourable balance of trade with Australia as the total value of imports based on 1933-34 figures was Rs. 102 lakhs against the total exports to Australia of Rs. 298 lakhs leaving a big margin in favour of India. Exports from India consist mostly of Jute which alone is valued at 243 lakhs. The leader of the delegation expects that with the development of Cochin and Vizagapatam harbours there could be direct shipping service with India and the Australian fruits and dairy products should have a

better chance in South India. It may be mentioned that the Imperial Council of Agricultural Research recommended to Government two years ago, protection of the Indian Dairy manufactures. The question of letting a big import of fresh fruits from Australia into S. India will, we are sure be considered when the time comes particularly in the case of such fruits as S. India can produce economically.

There are no doubt possibilities of increasing the production of fruits in the country but the industry has to be taken up by men with enterprise. That even tracts with poor soil and inadequate water-supply can be converted into prosperous fruit-growing areas is exemplified in the case of Palestine which has now a flourishing industry in grape fruit and oranges. Besides increasing the area under fruits, a definite knowledge is required as to what particular kinds of fruits can thrive under particular conditions of soil and climate. It is in giving information and guidance in these points, that the work of the several Agricultural Departments in India could come in handy and help the people to take to fruit growing. While generally in the case of most fruits one has to wait for some years before his plantation can be expected to give any returns, there are other varieties of fruits which can be cultivated by every one without much difficulty. The tomatoe and papayas are instances in point. These fruits contain the important vitamins A, B and C and when eaten in sufficient quantities are said to be a sure protection against beri beri and scurvy.

Almost every agricultural research station of Madras is doing some work on fruit trees suited to the locality with a view to gain experience and making it available to the people in the neighbourhood. Work on plantains is being carried on at the Agricultural Research Stations, Samalkota, Maruteru, Aduturai, Coimbatore and Pattambi. At the Pattambi Station in S. Malabar, it has been demonstrated beyond doubt that the growing of pine apples in dry *modan* lands is a highly paying proposition. Distribution of the pine apple and plantain suckers to various parts of the province is taken in hand by the department as a definite item of propaganda work. The need for a good orchard at the Coimbatore Central Farm to give some training in horticulture for the students has been a long felt want and the one started a few years back promises to be a success. The variety and the nature of fruits produced at this orchard which had been exhibited during the last College day and Conference would have easily convinced everyone of the enormous possibilities of fruit growing in particular tracts of this district.

Though there are a large number of nursery-men in the province who supply budded and grafted fruit trees, complaints about the material supplied are not uncommon. This is engaging the attention of the Department and the propagation of reliable seedlings and budded and grafted plants suited to the locality is now becoming an

important item of the Department's work. Even when suitable plants are not available in the Agricultural Station, the district staff help the growers in getting reliable material from reputed seedsmen. It must be remembered however, that the planting of reliable and good plants does not finish the problems of fruit cultivation. The plants must receive unremitting attention during the early stages if they are to develop into good bearing trees. The district staff is giving assistance by conducting demonstrations in proper methods of pruning, improved methods of irrigation and manuring. There is still another aspect connected with fruit growing in which the Department plays a very important part. Unlike agricultural crops, the fruit trees are subject to numerous insect and fungus pests. Any neglect of these at the proper time might spoil the whole crop. In countries where fruit growing is a developed industry, the growers themselves spray their trees periodically with insecticides and fungicides to protect them from pests. The only crop in S. India where as a result of intensive propaganda the practice of spraying with a fungicide is becoming general is the grapes. The application of chemical sprays and dusts to the fruit trees whenever necessary has now to be carried out by the district staff. This the Department will have to do until such time as the fruit growers themselves realise the importance of such treatment and are prepared to spend some money annually on it as a form of insurance.

Some work has already been done in Madras in the Government Fruit Gardens at Coonoor, Burliar and Kallar with regard to problems connected with fruits of temperate regions like pears, plums, apples, etc., but still there is a wide field for research on the essentially tropical fruits like mangoes, oranges and limes which are all important in Madras. The long felt need for a research station to work on these fruits has now been met by the starting of a station at Anantarajpet near Kodur in Cuddapah district from which tract comes the famous *Sathgudy* oranges of Madras. The Honorable Minister for Development who formally opened this station on the twelfth of this month rightly pointed out that it was an important land-mark in the history of fruit culture in the plains of this Presidency. All important aspects of fruit cultivation will no doubt receive attention at this new station, but one of the problems that will be immediately taken up is to make a survey of the existing orchards in this Presidency and outside in order to stock the station with the choicest parent trees for multiplication and ultimate distribution to the cultivators. It is also proposed to impart training in fruit gardening at this station.

We would like in this connection to draw attention to another important problem connected with the breeding of citrus which includes all the cultivated oranges and limes, which, we are sure, will receive attention at this station in due course. As a result of the

work of the famous Russian Botanist, Professor Vavilov, the importance of exploring the original homes of plant species and making greater use of the wild forms obtained therefrom in breeding; particularly in the vegetatively propagated species have come to be well recognised. Professor Tanaka of the Imperial University, Formosa, who is a world authority on citrus species and who is now on a visit to India points out that India is the original home of several of the citrus species and varieties, many of the forms which are at present under cultivation in the country or imported from outside being improved forms obtained by breeding from the wild types to be found in India. Professor Tanaka opines that an intensive study of the wild forms of citrus occurring in India should prove extremely valuable as it might lead to the obtaining of forms even more useful than what are already being cultivated in different parts of the world. We are glad to note that Mr. Nayak who has been appointed the Superintendent of this Fruit Research station, has had wide experience in fruit growing both in England and in several provinces of India—Bombay, Punjab and Bihar.

One difficulty that already exists and is bound to assume greater proportions with the extension of fruit growing in the country is the want of adequate transport and marketing facilities. The only fruits that are produced to any large extent in Madras and which find a place in markets outside, are the plantains and the mangoes, the latter only during particular seasons of the year. There is a great scope for improvement in the organisation and marketing of these fruits. Considering what has been done in more advanced countries, the fruit grower in South India in particular has yet to learn a lot concerning the method of harvesting the fruits, grading, and packing for transport. Probably the formation of associations and societies interested in particular fruits as for instance the Plantain Grower's Association of Trichinopoly, the District Fruit Growers' Association of Cuddapah, would be of help in taking joint action either in adopting an improved agricultural practice or making representations to get particular disabilities removed. The Provincial Marketing Officer, Madras, has made a survey of the present state of fruit industry in Madras and puts forward some constructive suggestions to develop the industry. We will be publishing his paper on the subject in the next issue of this journal.

THE TILLERS OF THE PEARL MILLET—*PENNISETUM* *TYPHOIDEUM* (RICH)

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Pennisetum Typhoideum, the pearl millet, is the second important millet in India. This millet is primarily the cereal of light loams in areas of low rainfall. Whereas *Sorghum* is mainly single-stalked and single-headed, the pearl millet is the very opposite of sorghum in being many-stalked and many-headed. In addition to this the plant is protogynous.

The details of the tillering habit of this plant were studied especially with a view to assay the economic aspect of this equipment. The study was made in two years and four seasons, two of them rainfed and two irrigated. The system of branching and the order of flowering were observed in 46 plants, both rainfed and irrigated. The yield of the various kinds of tiller heads was taken in a total population of 278 plants, 78 of which were of the dry land type and 200 of the irrigated—all chosen at random from some of the typical local varieties.

The first subject of study was the internodal lengths of the main stalk of the plant. This stalk is the one that grows right from the seed. The number of internodes above the ground level on this main stalk varies from 6 to 12, nine being the commonest. The next frequent are those with 8 and 10. These exclude the group of very closely disposed internodes which are underground and which give rise to the Primary Tillers. On this main stalk, measurements of the internodes were made in the 9 internoded plants and the trend of the internodal lengths could be expressed graphically by the following numbers representing segments in a thousand—unit length from base upward :— 30, 70, 95, 115, 120, 125, 120, 110 and 215 (Fig. ix). It will be noticed that the bottom-most internode is the shortest in length. The next upper one is a little over twice the first. The third, fourth, fifth and sixth internodes show a progressive increase in length, the seventh and eighth ones a slight decrease, and the ninth and final one, viz., the peduncle, is the longest, being about a fifth of the stalk. In odd instances the fifth or the sixth internode may be shorter in length than the ones immediately below and above it.

The main stalk gives rise to one or more primary tillers arising at or below ground level. These tillers may be a little more or less in height than the main stalk. In internodal lengths they conform

Fig. 1

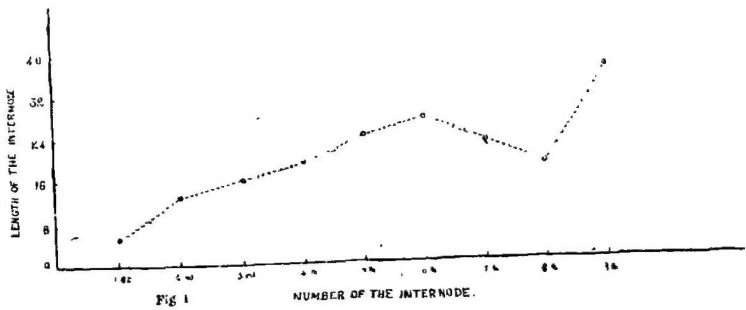
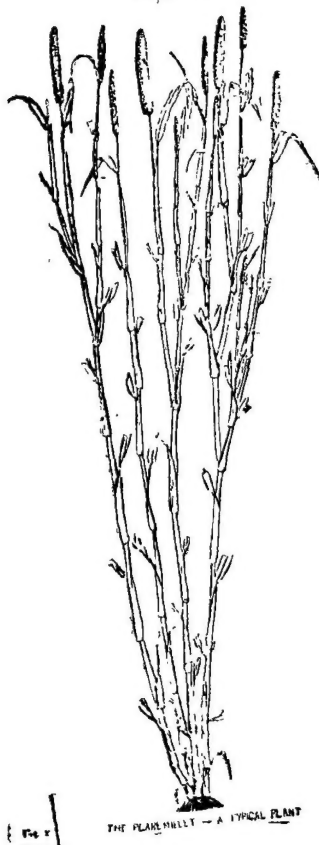


Fig. 2



THE PEARL MILLET — A TYPICAL PLANT

THE PEARL MILLET—A TYPICAL PLANT

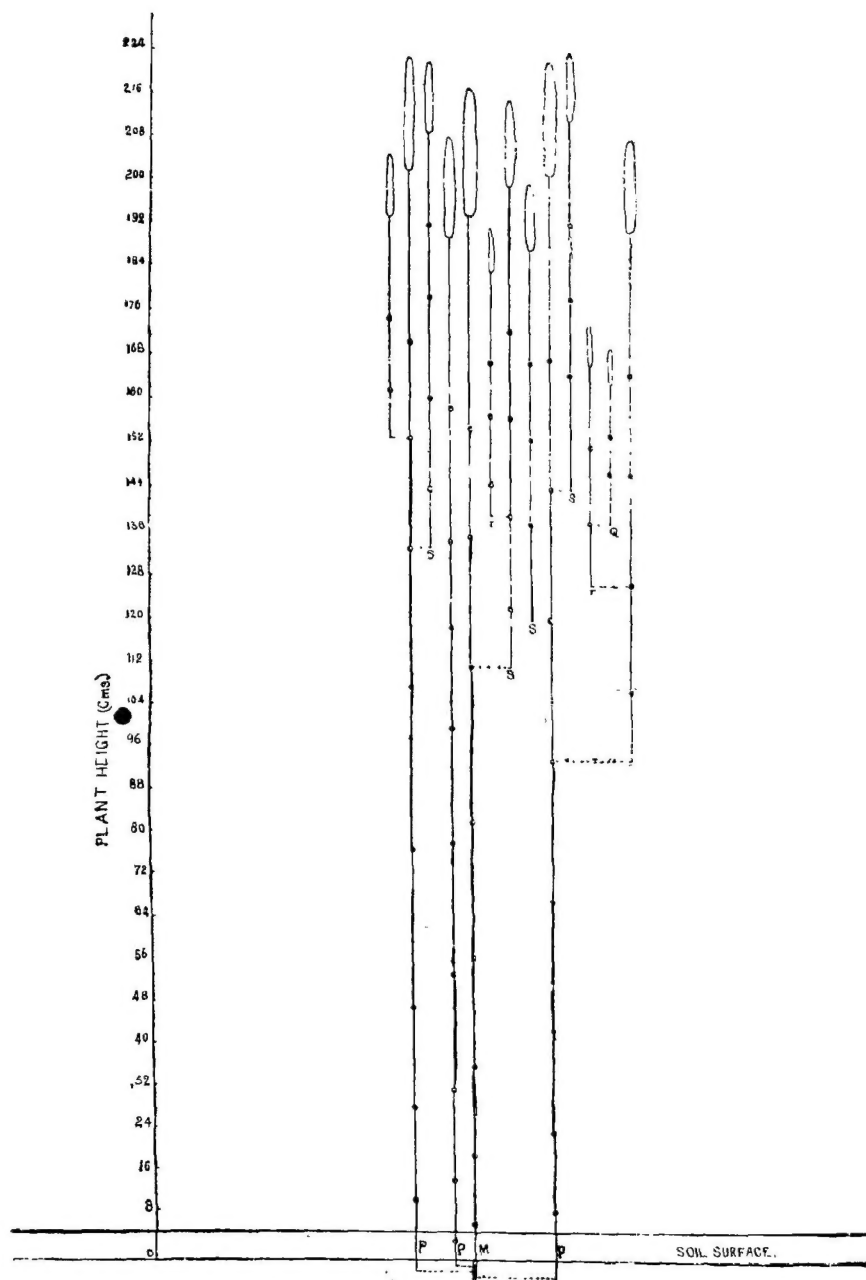


Fig. 3. BRANCHES OF A TYPICAL PLANT
IN
Pennisetum typhoides (Rich) — THE PEARL MILLET.
M=main stalk, P=primary filler,
S=secondary branch, T=tertiary branch & Q=quaternary branch.

to the general trend indicated for the main stalk. This general resemblance to the main stalk makes the group of principal heads, both the main and the primary, the chief source of grain yield in this millet.

Arising both from the main stalk and the primary tillers are the secondary branches. These branches are found to arise from the nodes (leaf axils) in the aerial portions of the main stalk or of the primary tillers. Usually they arise from about half the height of these main and primary shoots (Fig. 2). These secondary tillers are 3 to 5 noded (leaved). Their internodal lengths, when five, tend to a distribution similar to that noted in the main stalk and primary tillers. This repetition on the part of the secondary tiller, the progenitor of another earhead, is very interesting. The secondary earheads are naturally smaller than those of the first group but tend to shoot up and keep more or less the same heading zone.

In abnormal seasons or untimely opulence the secondary branches may make a feeble effort at producing branches. These tertiary branches produce very small heads and are borne on thin stalks which are 3 to 4 noded (leaved). In the 4 noded of these, the general tendency for a shorter internode to intervene between the peduncle and the longer internode below, is indicated. The contribution of these tertiary branch heads to the total grain yield of a plant is negligible. They are merely in the nature of an outlet for untimely facilities for growth. Tertiary branches may occasionally give rise to a feeble quaternary branch. This endeavour at the production of such late and weak branches on the part of the secondary and tertiary branches, is the unavoidable sequence of the stimulation of axillary buds so very necessary for the production of secondary branches, whose contribution to grain yield, especially in times of adversity in which there is a diminution in the due output of grain on the part of the main or primary heads, is appreciable.

In figure 2 is sketched a typical *Bajri* plant with its various classes of tillers described above. In figure 3 is given a graphic presentation of the same plant teased up to a parallel disposition of the component parts. It will be noticed that the main stalk is not alone but that there is an endeavour at producing more than one tiller from the ground level. Each of these stalks arising from the ground produces a branch or branches with earheads that are in the nature of a reserve in case of adversity.

This pearl millet is primarily the cereal for areas of precarious rainfall and of sandy soils with poor retentiveness of moisture. Big leaves are unsuited to such conditions. Many small leaves are a necessity. A one-stalked effort may end in disaster as the plant lacks the reserve moisture present in soils suited to the sorghums. Therefore

a first output of primary tillers, and a second gush of secondary branches with their earheads of decreasing size (with an average surface area of 115, 90, 50 and 20 sq. cm. per main, primary, secondary and tertiary head), ensure a many noded, and therefore many leaved condition, (usually up to 60, with a range of about 35 to 90), and serves admirably the needs imposed by its habitat.

The demands of protogyny are met by a compacting of the earhead zone. The branches contribute to this object by an undue elongation of their peduncles which in these are about a fourth to a third of their length as against the fifth of the peduncle length in stalks arising from the ground.

The observations recorded above apply generally to both rainfed and irrigated varieties. There is this difference however between them, viz., a comparatively less incidence of secondary branches and a total absence of tertiaries in the irrigated (see table below).

This difference in the tillering habit between the rainfed and irrigated varieties is reflected in the duration of their flowering. In irrigated varieties the first flush of anthesis is finished in a week. After this, heads from the branches may open their flowers and linger on up to a maximum of three weeks after the first flush. In rainfed varieties the duration of the main flush of flowering is spread out over a period of about 12 days and the last of the tertiaries may be found to have its anthers extruded well after the seeds in the preceding group of heads have set and the crop is ready for harvest.

The order of flowering in a plant was also studied in all the classes of earheads and it could be set down broadly to be as follows:- The head of the main stalk flowers first. Next to it is that of the primary tiller from the lowest node among the ones underground. Next in order is the one arising from the node immediately above it and so on until the primaries finish. In the case of the secondary branch heads the order is generally reversed. Should there be more than one secondary head on the main stalk or any of the primary tillers, the one above flowers earlier than the one below. Similarly in the case of the tertiary branch heads.

The number, surface area and grain yield of these earheads were evaluated by taking counts, head measurements and grain weights on the 78 type plants belonging to the rainfed group and the 200 of the irrigated group. The very late and immature quaternary heads were founded to be negligible both in number and yield and are omitted. Keeping one hundred as the unit, the centages in number, surface area of the major kinds of earheads and of yield per plant were arrived at and are given in the table below.

Season and population.	Number of Earheads.				Surface area of Earheads.				Grain Yield.			
	1 Main stalk head.	2 Primary tiller heads.	3 Secondary branch heads.	4 Tertiary branch heads.	1	2	3	4	1	2	3	4
Main. (Rainfed) 78 plants.	7	32	55	6	20	40	35	5	10	35	50	5
Summer. (Irrigated) 200 plants.	20	60	20	-	25	65	10	-	30	55	15	-

The substantial contribution of the heads from the secondary branches in rainfed varieties and the marked contribution of both the main and primary heads in irrigated varieties is prominently brought out.

Germination tests made on seeds gathered from the various classes of earheads did not show any appreciable differences in their sprouting energy. On an average 90 to 100 per cent. of the seeds from the main stalk and primary tiller heads and 88 to 95 per cent. of the secondary and tertiary branch-head seeds germinated.

It was also noticed that the size of the seed showed a progressive decline with the lateness of the earhead. An estimate of the size of the various classes of seeds was made by counting the number of seeds required to weigh two grammes. About fifty such readings were made in each kind of seed and it was observed that those from the main stalk head numbered from 300 to 400, those from the primary tiller heads 400 to 460, those from the secondary branch heads 500 to 680 and those from the tertiary branch heads 800 to 1500.

These studies reveal how eminently the tillering habit, the flowering sequence of the tiller and branch heads and the general organization of the vegetative and the reproductive phases fit the pearl millet for its role among the cereals.

THE SUGAR INDUSTRY OF AUSTRALIA.

The world congress of sugar-cane technologists that met at Brisbane in Australia towards the end of August this year was the fifth of its kind. The above Society meets once in three years and alternately in the Western and Eastern hemispheres. The last or the fourth session met at Porto Rico in 1932 and the next one is programmed to meet at Louisiana in the United States of America in 1938.

The Indian delegates to the above congress who reached back to India between the middle and the third week of last month consisted of Seth Lalchand Hirachand—owner of a sugar factory and plantation

in Bombay and brother of the well known Seth Walchand Hirachand, Rao Saheb Kasanjee D'Naik sent by the Kesar Sugar Factory, Bareilly in the United Provinces and Rao Bahadur T. S. Venkatraman, the Sugarcane Expert to the Government of India stationed at Coimbatore.

Through one of the Coimbatore canes—viz. Co. 290—India was already known to the Australian Sugar Industry chiefly of the Southern regions. This Indian cane has proved useful to the Australian industry owing to its great resistance to frost and to many of the cane diseases prevalent in Australia. The Hon'ble the Minister for Agriculture, Queensland, made a special reference to the work of the Indian Sugarcane Expert and Sir Leslie Wilson, once the Governor of Bombay and now of Queensland showed a special interest in the delegates from India.

Sugarcanes are used for feeding cattle and horses in Australia. For this purpose they are chopped to $\frac{1}{8}$ th inch in the case of horses and to $\frac{3}{8}$ th inch in the case of cattle, mixed with wheat bran, molasses etc. and fed. The animals are said to relish and thrive on such mixed feed.

It was interesting to see in Australia the various ways in which molasses was being utilized. Recently there has been a glut in India and many factories found themselves with stocks of molasses which they were unable to dispose of. It is applied directly to fields as manure at 5 to 8 tons to the acre, mixed in cattle food and used in the manufacture of power alcohol. This molasses-power alcohol is mixed with Benzene in a certain proportion and all Government vehicles are enjoined to use this mixture.

The Sugar Industry in Australia has certain features of special interest to those engaged in sugar. For one thing, Australia grows the sweetest cane in the world—the peculiar set of climatic conditions, obtaining in that country contributing to this happy result. The dominant cane in the Australian industry is Badila, a cane which has proved useful—under the name of Fiji B—in one of the sugar estates in South India.

Secondly the wages for labour in Australia are very high—the field labourer in that country having to be paid by law per day as much as a labourer in India or Java receives for almost half a month. At the time of the Congress this worked to almost Rs. 9 a day. This has resulted in a marked development in that country of labour saving machinery which is employed all through the life of the crop from the planting to the harvest. The output per man hour is therefore much higher in Australia than in most of the other cane countries of the world.

Thirdly, though it is comparatively more costly to produce sugar in Australia because of the 'white Australia' policy, the industry is kept going so as to provide the Australians with home sugar, to secure

employment for the people and to colonize and populate the North part of Queensland which is considered to be rather a vulnerable point in that country. It is only the sugar industry there that is keeping the people on that land. The higher cost of production is largely due to the higher wages for labour in that country which again is due to the higher standard of living that is maintained therein. Cheap black Kanaka labour was once employed in the sugar plantations but this has all been steadily substituted by white labour.

The sugar industry in Australia is artificially nurtured, controlled and protected in all stages—the area of supply being assigned to each factory, wages of labour and hours of working fixed, compulsory holiday enforced in the factory on Sundays, and the price to be paid to the grower fixed as also the price at which sugar is to be sold in the Australian market. The peculiar basis on which the Australian Industry is run will be evident from the fact that at the time of the Congress the price of sugar in the home market was 4 pence a lb though its selling price in London market was only about $1\frac{1}{2}$ pence (both in Australian currency). In spite of this obvious loss on every ton of sugar exported—this was roughly computed at about 6 to 18 pounds (Australian)—that country finds it necessary and worthwhile to keep the Industry going for the reasons already indicated.

The obvious lesson to India is that it is necessary to keep the ancient industry of cane growing in India going and develop it in all ways in the interests of the agricultural prosperity and well being of the country as a whole. The Government of our country was therefore fully justified in affording the sugar industry of India the tariff protection it is receiving at present.

“A Delegate”.

THE IMPORTANT INSECT PESTS OF THE CASTOR OIL PLANT IN S. INDIA WITH SUGGESTIONS FOR THEIR CONTROL.

By Dr. T. V. RAMAKRISHNA AYYAR, B. A., Ph. D.,

Retired Government Entomologist.

Among the different oil seed crops cultivated in India, the castor plant (*Ricinus communis*) appears to be one of the most important and extensively grown ones. Recent statistics* indicate that among the well-known castor growing areas of the world, such as Brazil, Russia, India and Egypt, India stands not only as the foremost grower but is also responsible for over 90 per cent of the world's export trade in castor. Inside India though the crop is cultivated in small areas in parts of Berar, Baroda, Behar and the United Provinces, we find that

* The writer is indebted to Dr. Patel, the Oil Seed Specialist for information on this point.

the largest area under castor is to be found in Peninsular India including the Nizam's dominions, Mysore and the Madras Presidency; in fact, the area under this crop is greatest in the Nizam's dominions, the ceded districts and Mysore coming next in order. It is also well known that apart from its use as an oil seed producing plant, the castor plant is also utilised in many parts of India to feed the eri silk-worm—the rearing of which is becoming a popular and important cottage industry; in fact, the eri silk-worm is so named after its food plant (*Erandi* or *Eri*—castor). In view of such importance, it is up to South India to do everything in its power to hold its own superior position as the premier castor growing area in the world. One of the duties of the South Indian Castor grower, therefore, is to have sufficient knowledge of the insect pests, which cause serious damage to the growing crop, which often results in substantial loss to him.

It is the writer's idea in this paper to give the South Indian castor grower some general ideas of the more important insect enemies of that plant in this province with some suggestions in controlling them, so that they might be able to grow as far as possible a pest free crop.

Insects found on Castor. Of the several insects which levy their seasonal toll on the castor crop in the different areas of this province the more important and the more numerous are those which feed on the foliage and the great majority of these are what are known as leaf eating caterpillars. Among the others which possess other habits such as boring into the plant tissue or sucking the plant juice, we have a shoot and capsule boring caterpillar, a stem boring beetle and some bugs including what are known as leaf hoppers, scale insects, stink bugs and mealy bugs. The important insects so far noted as more or less injurious to the castor plant can be grouped conveniently as below showing the general habits and the insect group to which each belongs.

Table of Castor Insects.

A. Caterpillars. (Biting insects).

I. Feeding exposed on the foliage.

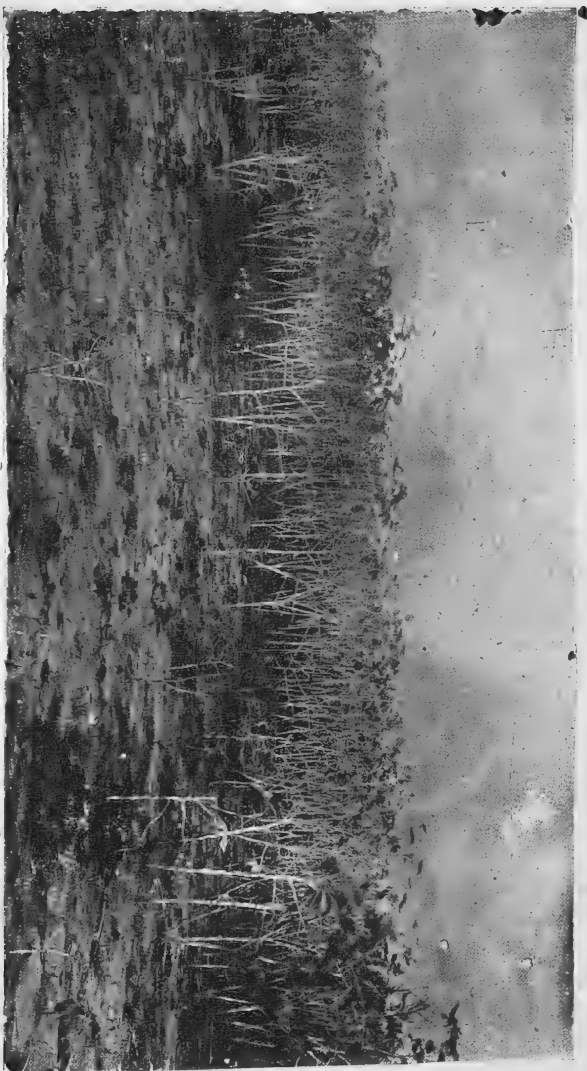
- (a) Smooth caterpillars (both moths).
 - i. Semilooper *Achoea janata*, L.
 - ii. Ordinary *Prodenia litura*, F (known as the Tobacco caterpillar).
- (b) Hairy caterpillars (all moths).
 - i. Uniformly hairy Black—*Pericallia ricini*, F
 Yellowish—*Diacrisia obliqua*, W
 - ii. Hairs with tussocks also Reddish—*Euproctis fraterna*, M
 Greyish—*Olena mendosa*, H
 Yellowish brown—*Orgyia postica*, W.
- (c) Case bearing caterpillar (moth)
 Bagworm—*Clania crameri*, W.
- (d) Spiny or slug caterpillars
 - Spiny—*Ergolis merione*, Cr. (Butterfly)
 - Sluglike—*Parasa lepidus*, Cr. (Moth).

- II. Boring caterpillar—The shoot and capsule borer—*Dichocrocis punctiferalis*, G. (moth).
- B. **Beetles.** (Biting insects).
- I. Leaf eating—Flea beetle—*Heimaphysa ruficollis*, L.
- II. Boring beetle—shot hole borer—*Xyleborus fornicatus*, E.
- C. **Bugs.** (Sap sucking insects).
1. Stink bugs—The green plant bug—*Nezara viridula*, L.
2. Leaf hoppers—the green jassid—*Empoasca flavescens*, F.
3. Scales and mealy bugs—Black scale—*Saissetia nigra*, N.
4. Mealy wings—castor mealy wing—*Trialeurodes ricini*, M.

Major and Minor Pests. From the above it is evident that about twenty forms pay their attentions to the castor crop to a smaller or greater extent now and then. However, the castor grower need not be frightened at this fairly long list of insect guests, since it is generally found that neither do all these insects appear as regular pests season after season, nor does any one of them cause equally serious damage. Some of them are of minor importance and some others only appear rarely as sporadic pests while only a few are of real importance. The above list is given however to give the cultivator a general idea of castor insects to help him to make them out when they appear on the crop. The really serious or major pests of castor which appear more or less regularly and cause appreciable injury to the crop are caterpillars including some of the leaf eating forms and the seed and shoot boring caterpillar.

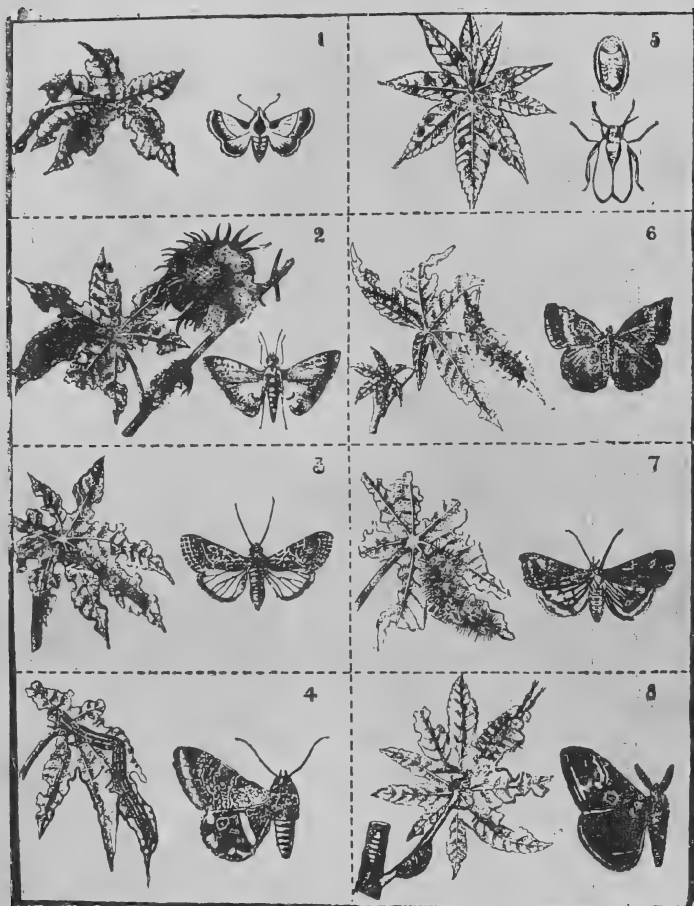
Leaf-eating Caterpillars. It is hardly necessary to state at the outset that these caterpillars are the young ones or larval stages either of moths or butterflies and these latter which are the adults do not cause any direct harm to the growing crop. Among the ten leaf-eating forms noted above under this category the semi looper *Achoea janata*, L. is the most important and is a specific pest of castor found very rarely on other cultivated plants. It enjoys a very wide distribution being found all over India. The adult insect is a stout built dark greyish brown moth with the fore-wing showing wavy brownish transverse lines and the hind wing having black and white patches. (Fig. 4 plate). The full grown caterpillar which injures the foliage is about 2 to 2½ inches in length, smooth and having a greyish to dark brown colour (occasionally different shades of brown colouring are noted often with dark and brown markings also). Unlike the great majority of caterpillars which crawl about like worms, this insect is a semi looper the first pair of pro-legs becoming functionless. The insect starts its active life from young caterpillars hatching out of bluish green round beautifully sculptured eggs laid singly on the tender portions of the castor plant. Young caterpillars pass through the usual moults and in about two weeks assume the full grown condition described above. It is during this period that the damage is done to the foliage and this is often so serious that a whole plot is completely

stripped of the foliage in the plants which are practically skeletonised. (Fig.) When fully fed the caterpillar changes into the pupa condition either under the soil or inside folds of leaf on the plant itself and emerges as the adult moth in about another two weeks. The whole life cycle from egg laying to adult condition generally occupies about four weeks; this period varies according to weather conditions in different localities. As stated above this insect is found very rarely and only in small numbers on other plants and these include the Rose, the Pomegranate and one or two species of *Euphorbia*. For details on the bionomics of this insect reference may be made to Lefroy (1). All the leaf eating caterpillars of castor have more or less the same life histories with, of course, some differences, in the manner of egg laying, pupation and other minor characteristics. Next in importance to the castor semilooper comes the smooth cylindrical stout caterpillar (*Prodenia litura* F. fig 3 Pl.). This insect, the adult of which is also a stout built brown moth, is a very common insect found in a number of other plants besides castor and is a specific pest of tobacco; hence popularly known as the tobacco caterpillar (4). The eggs of this moth are laid in batches of many, each batch being hidden under a covering of felted hairs. The young caterpillars feed together gregariously during the earlier stages and separate gradually as they reach the full grown period; at this latter stage the caterpillar is about an inch and a half in length, cylindrical and of a dark to blackish brown colour with yellowish and dark patches on the segments. The pupation takes place underground in an earthen case; in a week or ten days the adult emerges from the pupa. The other caterpillars feeding on castor foliage are not of general occurrence, but occasionally appear as sporadic, and sometimes cause serious damage. The commonest of these are the different hairy larva of which the tussock caterpillars are the ones more frequently noted. These are all larvæ of moths and among these the yellowish brown form (*Orgyia postica* W. Fig 8. Pl.) now and then assumes destructive proportions as may be found from the author's paper ^a on this insect and his colour plate in another paper ^b. The other two tussock caterpillars and the hairy caterpillars are *Euprotis fraterna*, *Olene mendosa*, *Pericallia ricini* and *Diacrisia obliqua* having the same habits as *Orgyia*; these are occasionally found in company at the same time. The last two are however very rarely seen in serious form. *Pericallia* (Fig. 7 pl.) is a more common pest of banana and lablab and *Diacrisia* is generally found on the bills and in North India as a general feeder. The bag worms which move about often enclosed in bags or cases made of thorns and sticks are not serious on castor in S. India. The slug caterpillar (*Parasa lepida*, C. fig. 1 Pl.) which is apple green and covered with irritating spines and hairs is occasionally found as a pest on castor. The pupal cases of the creature are found as hard shell like objects attached to the plant stem (see fig. pl.) The spiny caterpillar (*Ergolis*) is the only one among these numerous



Castor Crop defoliated by Leaf eating Caterpillars

INSECT PESTS OF CASTOR



- Fig. 1. Castor Slug.
 Fig. 2. Boring caterpillar.
 Fig. 3. Leaf eating caterpillar.
 Fig. 4. Castor Semilooper.
 Fig. 5. Castor mealy wing.
 Fig. 6. Spiny caterpillar.
 Fig. 7. Black hairy caterpillar.
 Fig. 8. Brown hairy caterpillar.

Parasa lepida.
Dichocrocis punctiferalis.
Prodenia litura.
Achoea Janata.
Trialeurodes ricini.
Ergalis merione.
Pericalia ricini.
Orgyia postica.

caterpillars which is the larva of a butterfly instead of a moth; the insect is a uniform snuff brown creature found flying about during day time unlike the moths (fig. 6 Pl.)

Borers. We now come to the borers which include (a) a caterpillar (*Dichocrocis punctiferalis*, G.) which is in fact a somewhat important pest more or less with a status equal to the semilooper or the commoner leaf caterpillars and another (b) a small dark brown stem boring beetle (*Xyleborus*). The former is a short stout pinkish brown caterpillar with dark spots. It bores into the shoots especially at the junction of the main stem and the side shoots or leaves and in addition it also attacks the ripening fruits or seed capsules. The incidence of this insect on the plant is indicated by the presence of black excrementitious matter and webbing covering infested shoots and seed capsules. This broing caterpillar is often noted as a pest of Turmeric, Ginger and Cardamom also in different parts of S. India. The adult insect is a medium sized moth with yellow wings, spotted in dark (Fig. 2 pl.).

Beetles Coming to beetles and bug pests of castor, most of them are of minor importance and are very rarely found as serious. The boring beetle (*Xyleborus formicatus*, E) is a small reddish brown creature found usually boring into the stem and producing numerous holes just as is found on bamboo and other posts in buildings throwing out powdery matter from the stem. This was found serious on a species of the red variety of castor in Bangalore and has been recorded by the author in a previous paper ⁵ with a plate. It is an insect found on Tea and other hill plants in Ceylon and South India. Tender leaves of castor are occasionally found attacked by a very small greenish flea beetle (*Hermacophaga ruficollis*, L); numbers of this creature often bite small round holes on the leaves and thus injure the foliage. These are very active creatures and leap like fleas.

Bugs. Among sucking insects found on castor the commonest is the mealy wing (*Trialeurodes ricini*, M. fig 5 pl.) which has a wide distribution all over India. It is a very small snow white winged moth like creature, often found in thousands on the under surface of castor leaves, especially on the foliage of fairly well grown plants. Hundreds of small yellowish seed like eggs are laid by this bug and from these emerge practically stationary larvae which are the real pests sucking the nutrition from the foliage. These larvae are more or less fixed to the leaves like scales, and in bad infestations the whole field appears pale ashy white and sickly and sticky to the touch due to the sweet secretion thrown out by thousands of these larvae. Scales and mealy bugs are rarely found and the species usually found among scales are the common black scale (*Saissetia nigra*, N.) the one generally found on various plants like cotton, coffee, Guava, *Thespesia* etc. and among the mealy bugs the common tomato and croton mealy bug

(*Pseudococcus virgatus*, C.) is sometimes found. Both these are very rare and hardly cause any injury to the plants.

During the younger stages of the crop a small green leaf hopper (*Empoasca flavescens* F.), almost similar to the one that attacks cotton, sometimes appears in swarms on the foliage, suck up the juice from the leaves and make them fade and curl up; but very rarely is serious harm caused. From the above brief account we find that the only important insects the activities of which the castor grower in South India will do well to watch are a few of the leaf eating caterpillars and the borer caterpillar.

Control Measures. As in the case of most pests, both preventive and curative methods can be adopted in the case of castor pests also. For the leaf infesting caterpillars both preventive and curative measures can be adopted; the former consists chiefly of cultural operations which will make the plants vigorous and keep away or withstand pest attacks, and the latter of mechanical and insecticidal operations. Among mechanical operations, the picking of egg masses and clipping off of and destruction of leaves containing numerous young caterpillars feeding together will be found very useful in the case of the tobacco caterpillar and the hairy larvae, all of which lay eggs in masses and the young caterpillars of which are gregarious in habits. In the case of the castor semi-looper and frequently with the tobacco caterpillar prompt hand picking of the smooth caterpillar will be found effective and economical. When, however, the caterpillars are noted late at a time when they have already multiplied and increased in numbers and may not be amenable to any of the above measures, insecticidal methods can be used with advantage. The insecticides in this case where the creatures are all biting insects stomach insecticides (viz. those which cover the plant surface which when eaten will poison the insects) are to be used. These usually include arsenical preparations. Lead arsenate and Calcium arsenate are the ones which can be used either in the powder form or as a spray liquid mixed with water. In those localities, however, where water cannot be easily got, dusting the insecticide as a powder is certainly more effective and economic; dusting should however be done where there are no strong winds in the field or if the winds persist, then it is better to use the material as a spray. Dusting will be very effective if done early in the morning when there will be dew drops on the foliage which will make the poison dust stick to the leaf surface. These insecticides and the necessary appliances such as dusters and sprayers can be easily got from wholesale chemists or through the officers of the Agricultural Department.

For the shoot and capsule boring larva only preventive measures can be adopted since the creature feeds from inside and no external applications of insecticides will have any effect on it. The measures suggested are the prompt cutting off and burning of infested shoots and capsules and preventing their multiplication. The same is the

case with the stem boring small beetle (*Xyleborus*). Very rarely do any of the sucking insects (bugs) found on castor call for any serious attention. If and when they do appear serious a spray with crude oil emulsion or tobacco decoction will check them easily. The mealy wing and any mealy bugs will also be easily controlled by such a spray. For the leaf hopper, when it becomes serious the waving of boards or winnows smeared with gum or some sticky material will trap hundreds of the hoppers and appreciably reduce their number on the crop.

In speaking of control measures it is possible that with some gradual observation and experience the cultivator can adopt in certain cases the method known as the Biological control of pests; this chiefly consists in the discovery of the enemies, especially insect enemies of the plant pest and artificially make use of them to destroy the pests. Different insect pests have different kinds of enemies and these have to be discovered and their habits and pest controlling capacity tried. In the case of castor caterpillars—the castor semilooper has been found subject to three or four parasitic insects which destroy it, very appreciably during certain seasons. The commonest of these parasites is a small dark braconid wasp (*Microplitis ophiusae*, R) described by the writer in his paper in 1921³. The presence of this parasite is easily found out by the peculiar position occupied by the parasite cocoon under the tail end of the dying semilooper caterpillar. Other wasps have also been noted recently on this and some on the castor boring caterpillar among the Ichneumonid and chalcid wasps. When the presence of such parasites is noted in the field it is better to collect these and keep them in a wire gauze cage near the field so that the wasps which emerge can pass out through the meshes of the gauze cage while the moths if any from the cage cannot emerge through the small meshes of the gauze. The beneficial wasps will go into the fields and do their good work on other caterpillars.

In conclusion it may be stated, that though the castor crop suffers less from insect pests compared to other crops like cotton, cholam or paddy, the damage it occasionally suffers from caterpillar plagues is often wholesale and very serious. The castor cultivator cannot therefore afford to ignore the insect pests of his crop and allow them to levy their heavy toll during certain seasons. A general knowledge of these pests will certainly be of advantage to him to save his crops from the clutches of insect pests and it is hoped this paper might help him to some extent in that direction.

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THE WAY OUT

BY J. RAGHOTHAMA REDDY—STUDENT (B.Sc., III.)

The complexity of the Indian situation, as it exists to day is so immense and the causes so complicated that it is wellnigh impossible to think of any one aspect as divorced from the other. Yet two problems, the unemployment of the educated and the agricultural backwardness of the masses do loom large on our socio-economic horizon. These two problems have during the past few years defied all attempts at solution and continue to make a demand on the constructive statesmanship of the greatest of us. And therefore any scheme or any course of action which combines in itself the solution entire or partial of these two important issues merits not only careful consideration but a bold trial, and it would be ideal if a solution of either problem can be achieved as a direct or indirect result of the other being tackled. Of the two issues, the unemployment of the educated middle class being considerably smaller in magnitude, can be tackled first and the enormous energies of educated youth can be liberated and harnessed to the advantage of "greater India". When sure enough we will be nearer the solution of the rural problem with the field of scientific agriculture being so vast and so pregnant with potentialities, that it affords a promising field for the absorption of the energetic youth. If during the last so many years no considerable number of the educated classes has gone back to the land, it is due to no fault of theirs. Students from arts colleges found themselves unfit for the task, and even the graduates of agriculture lacked push and courage to fall back on their own resources. Above all, a secure and comfortable berth in Government service as against the hazardous profession of agriculture held out more temptations. Circumstances have thus conspired to make the Indian youth develop a lethargic outlook with the result that he would rather remain unemployed than resort to an independent though risky profession, as agriculture is at the present day. Whatever may be the reasons for this deplorable state, the tragic fact has to be boldly faced and unless he is put on the land with all conveniences provided, even a graduate in agriculture is not likely to take to his profession in near future.

There are in all parts of the country vast stretches of land which can be profitably reclaimed to advantage and brought under scientific farming. Educated unemployed youths may be allowed to start farms on such areas with the financial aid and active inspiration of the Government. If any thing substantial is to be done these farms ought to be worked even as the Government farms are, only with this difference, that the responsibility of profits and losses is transferred to the individuals.

The graduates as they emerge in large numbers annually from the Colleges of agriculture should be absorbed into the system and should be promised a small allowance for a limited period of 3 years. During this period they should for some time be put on some farm to undergo practical training and later should be left with separate blocks of fields to work them out to an economic success. Once this is done the young graduate will begin to have confidence in himself and then a certain number (about 20 or 25) should be made to colonise in a readily accessible part of the country with separate areas of about 50 acres each but all situated near one another. Lands should be provided by the Government. Implements and livestock should be purchased on a co-operative basis. Large machinery like threshers, cane crushers, oil expellers, cotton gins, sprayers and other rarely used machinery should be common to them. All common articles like the above machinery should be under the control of a committee from amongst them and should be supplied to one or the other according to the urgency of the work to be done.

Permanent improvements on the land like levelling, provision of drainage, construction of permanent irrigation channels, residential houses and coolie quarters, sinking of wells etc. should be financed by the Government to be recovered, in easy instalments. The marketing etc. should be done together and the whole concern must be like that of a single closely knit family. An organisation like the above stands the risk of being condemned as one calculated to perpetrate the dominance of the educated middle classes unless demands of labour interest are adequately met. To get over this the colony in return to the Government aid may be required to be controlled by special laws and legislation for the regulation of labour charges. A share of $\frac{1}{2}$ to $\frac{2}{3}$ of net profit after deducting expenses on livestock machinery interest on certain items of capital expenditure etc. if divided among the labourers would easily satisfy them. This division of profits should not be carried out either for every crop or for every year, but should only serve as a guiding principle for fixing wages. From time to time a committee of labour leaders, officials, non-officials and representatives of proprietors may be appointed to go into the question more fully and fix up reasonable wages to be paid, subject of course to the fluctuations in commodity values.

It may be contended that for a collective practical farming scheme like the above the advanced knowledge of agriculture and its allied sciences afforded by the degree in agriculture is not necessary. But it can readily be seen that such an advanced state of knowledge is not only useful for the immediate purposes but will also give the small scale proprietor a fuller grasp of ultimate problems, economic, agricultural and political.

Culturally also they may form a single highly organised and efficient unit. They may be brought together not only for recreation but

for discussing kindred problems and arriving at solutions. Given facilities, such a colony will easily form the most efficient centre from which will emanate valuable literature in the form of bulletins and pamphlets now prepared solely by Government agencies. Moreover, the conclusions arrived at by these young pioneers will have the backing of actual field conditions and will embody in themselves a type of popular appeal which the Government literature is ever bound to lack in.

If these are to be of maximum use and educative value, they should be spread out all over the country and more particularly in densely populated areas, where intensive agriculture is the crying need of the hour. It may be difficult to get large tracts of lands in early stages but in course of time a popular organisation can easily buy up lands, where ever necessary, either in bits from peasants or in large areas from declining zamindaries or others in the grip of money lenders.

A colony of a thousand or less acres for every taluk will cause a stir in the agricultural consciousness of the masses and will achieve useful results the magnitude of which it is difficult to imagine today. Once this is done the department can relax its attention as regards agricultural propaganda to a considerable extent and can more elaborately and exhaustively turn its efforts to scientific research and general organisation. These centres of modern agriculture will soon grow in importance and will become seats of agricultural pilgrimage to the ryots, from where they will derive hope and inspiration for future. The scheme thus solves at one stroke, two knotty problems the employment of the uneducated middle class youth and propaganda for the betterment of the peasant. The question will now arise, what happens to the labourers? The influence on them will be of a more far-reaching nature. When wages are to be regulated by an impartial agency they are bound to rise to decent height and the competition will increase, as regarding employment in these colonies resulting in higher efficiencies. The proprietors having no way open to them to reduce wages as a result of competition will naturally resort to selection of better and more efficient men and hence as the demand for efficiency rises the general standard among the labouring class is bound to rise.

Thus within the folds of a single scheme on the lines indicated we solve to a considerable extent the rural and the urban problems and also greatly increase the national wealth of the land.

What is wanted is a bold policy and initiative by the Government, which if forthcoming is bound to bring in its train the solution of these great problems. And the scheme is so flexible as regards magnitude that there is absolutely no reason why our well to do zamindars should not rise to the occasion and become the torch bearers of the emancipation of rural India.

Will it be too much to hope that they will realise the gravity of the situation, and not only help their country but cover themselves with glory by their statesmanlike attitude, as worthy descendants of the aristocracy of the land, by readily agreeing to be pioneers in this scheme of rural development.

Whatever be the difficulties in the way a definite plan of action as outlined briefly above has to be done and that too quickly if the country is to be saved from the throes of an economic revolution. Will the facts be faced?

ORIGIN OF CITRUS SPECIES

Under the auspices of the Association of Economic Biologists, Coimbatore, Dr. Tanaka, Professor of Botany and Horticulture at the Imperial University, Foremosa gave a lecture on the origin of citrus species and varieties on the 14th evening. Dr. Tanaka who has been making systematic studies of the citruses of the world for the last 25 years is an authority on the subject. In his very interesting lecture, he explained how the earlier classifications of the citrus group into genera and species were very defective and referred to a much more satisfactory classification adopted by him and the characters on which such classification was based. He described the geographical distribution of each species in various parts of the world and pointed out that N. E. India was the original home of several of the species. Evidently these have been taken abroad in early times and many of the forms which are now either locally produced or imported from outside are improved types of these wild forms. He stressed the great importance of studying intensively these original homes of citrus varieties, as such studies might easily result in obtaining forms more valuable than what exist today. He hoped that such studies will be taken up in India which should benefit not only India but several other countries of the world interested in citrus.

ABSTRACTS

The protection of Barley-seed through post harvest pollination. By Merrit N. Pope. (*The Jour. of Her.* Vol. 26 No. 10 October 1935. P. 411.) A record of a remarkably unique experiment. Four spikes of a barley variety (Hanncher C. 1. No. 531) with unripe pollen were harvested, emasculated, and kept in distilled water; two days later, when most of the stigmas were receptive, these spikes were dusted with pollen from 2 other varieties. Fertilisation was evidenced in a few days and the seeds produced were sown in the next season and they produced spikes which showed their hybrid character, proving that viable seed can be produced by pollinating flower even after harvest. M. R. B.

The Etiolation Shoot method of Fruit Propagation. By J. Lambourne. (*Mal. Agri. Jour.* Nov. 1935 P. 514-) The paper is a progress report of work done up to September 1935, on propagation of fruit trees, at the Central Experimental Station, Serdang, Malaya. Many of the trees experimented with, are familiar to us, including citron, guava, mango, jack, *Eugenia*, lemon, lime, orange, and even tamarind. Incomplete as the investigation up to the present stage is, the results are interesting as it has been found possible to propagate by the etiolation method, (Vide M. A. J. July 1935) a large number of plants. Among those which root freely, making it practicable to raise a large number of them from small plants, are the lime, the lemon, the guava, the Mandarin orange and the *Eugenas*. For the mango, the method appears to be too slow, but the author

is hopeful that with modifications of the existing method, better results will be obtained in the future.

Besides orchard plants, other economic plants like, coffee, tea, cinnamon and gambier, have also been experimented with, and some success has been attained with coffee and tea. Further investigations will be watched with interest, as results obtained would go a great step forward in the vegetative propagation of many plants which are now raised only from seed. M. R. B.

Ascorbic acid (Vitamin C) content of some Indian plant materials. By M. Damodaran and M. Srinivasan. *Pro. Ind. Acad. Science Section B.* Vol. ii. No. 4; Oct. 1935. Pp. 377 to 387) The article is an extremely welcome and valuable contribution to our knowledge of the nutritional values of Indian plant materials, analytical data on the vitamin contents of which, are rather meagre. The authors, have by employing the Tillmans-Harris technique, determined for various plant materials, their Ascorbic acid content. Ascorbic acid is vitamin C, the anti-Scorbutic food essential. The following table, wherein food materials familiar to us, are divided into three groups, will be of great interest. It will be seen that oranges, chillies, drumsticks and *agathi* are high in this vitamin, while amaranthus, pepper, sugarcane, and snakegourd are devoid of it.

SOME PLANT MATERIALS

Rich in Ascorbic Acid.	Poor in Ascorbic Acid.	With no Ascorbic Acid.
1. Gooseberry	1. Margosa.	1. Amaranthus.
2. Drumstick leaves and pods.	2. Papaya.	2. Jackfruit.
3. <i>Agathi</i> .	3. Cluster beans.	3. Cucumber.
4. Cashew apple.	4. Sword bean.	4. Wood apple.
5. Custard apple.	5. Betel leaf.	5. Sweet potato.
6. Jujube.	6. Dolichos lablab.	6. Plantain stem.
7. Chillies.	7. Lady's finger.	7. Green pepper.
8. Limes.	8. Pomegranate. Juice,	8. Sugarcane.
9. Oranges.	9. Melon.	9. Snakegourd.
	10. Brinjal.	10. Ginger.
	11. Tender coconut Juice.	

Chillies are actually very rich in vitamin C content but the stalk and the seeds are extremely poor, and this constituting a good portion of the material lower the ascorbic acid value of the whole fruit. Among the oranges, the vitamin content varies with the variety, the *Sathgudli* being the highest the *Kamola* and the *sour Lime* being the lowest.

M. R. B.

Gleanings.

Manufacture of Golden-Syrup. Golden syrup is now made from clarified juice, to which raw sugar may be added to increase its density. The process is simple and can be carried out by any factory; the syrup prepared with cane juice has a better aroma than one prepared from refinery molasses. The solution is heated in a double bottom defecator (cast iron outer bottom and inner copper bottom), skimmed, and evaporated to a density of 20° *Baume*. The syrup is allowed to cool to 58° Centigrade; it is next treated with invertase at the rate of 0.25 gram per litre (dissolved in water). The action of invertase is to invert part of the sucrose and also to prevent sucrose from crystallising out from the final product. Invertase can be obtained as a yellowish powder from any drug house.

After adding the invertase, the syrup is allowed to stand twelve hours at the temperature of about 55° C. It is then decanted, concentrated to 40° Be., and finally run through a cooling coil to a storage tank from which it is filled into suitable tins. The reason for using open evaporators is to preserve the aroma which if treated under various vacuum would be destroyed. Abstract in *Facts about Sugar*, Vol. 30, No. 10, October, 1935).

Value of Organic Manures to Indian Soils. Experiences in other parts of the world lend support to the results and findings from Indian experiments. The average nitrogen content of Indian soils is 0.05 per cent and the organic carbon content is 0.6 per cent. Similar figures for European soils are 0.15 per cent nitrogen and 3.0 per cent organic carbon so that European soils are thrice as rich as ours in nitrogen and five times as rich in humus and still the demand is for organic matter. The needs of Indian soils are patent, and the manurial data portray the requirements correctly. Cattle, green and other organic manures are valuable to soils because they supply what is popularly known as *humus*, which is so essential to maintain soil fertility. Organic manures supply "body", "substance" or "heart" to the soil and this artificial mineral fertilisers cannot do. The need for organic matter for Indian soils is more imperative because the destruction of organic matter is more rapid under the high temperatures obtaining in India. The rate of destruction will be appreciated when it is stated that a soil receiving cattle manure at 10 tons per annum continuously for twenty years contained at the end of the period only 0.74 per cent of organic carbon as against 0.59 per cent of organic carbon in a soil that received no organic manure at all.

Though the point does not arise directly from the data for yields, mention may be made of the newer knowledge of the functions of organic manures. There is increasing evidence in India and elsewhere that organic manures influence for the better the quality of the crop. Thus seed obtained from a crop manured continuously with farmyard manure has been found to give a better crop than the seed from a plot manured continuously with mineral manures alone, or without any manure. Likewise, the crop raised with cattle manure possessed a higher nutritive value than the crop grown with artificial fertilizers alone or without this means that artificial fertilizers, valuable as they are as supplements, cannot altogether replace organic manures. It is thus evident, that if we neglect organic manures and endeavour to depend on artificial fertilisers, we shall be doing three things:

Firstly—we shall not be able to maintain the fertility of the soil;

Secondly—we may be failing to keep up the inherent cropping power of our seed thus nullifying the good results of plant-breeding;

Thirdly—we run the risk of producing food lacking in normal nutritive value.

Fortunately, there is now, a wide spread recognition of the need for devising means of improving the ryots' resources in respect of original manures by better conservation of manures and by the preparation of composts. (*Agriculture and Livestock in India*, Vol. V, pt. 5, pp. 603-604.)

Bamboo Honey. The first reference to sugar obtained from cane was made by Theophrastus in the third century B. C. He mentioned it as "honey which came from the Bamboo". (*Amer. Bee Journal*, November 1935, p. 512.)

Champion Milk Yields. The champion butter-fat and milk test at the recent show of the Royal Agricultural Society of Victoria, Australia, was won by a Friesian cow Ingolston Inka Josie, with an average of 68.58 lb. milk and 2.09 lb. butter-fat per day. (*Jour. Agri. Victoria* November 1935, p. 561).

Abyssinia and the Origin of Coffee. Coffee drinking has been discussed since the time of its accidental discovery in Abyssinia, many hundreds of years ago. It

is stated that a certain man was banished into the wilderness. As many others before him had died of starvation, the populace was amazed to find him in good health, a year later. He brought back with him the discovery of a new berry which *would sustain life*, and that was the coffee! (*Rice, Sugar and Coffee Journal*, August 1935; Vol. 38; No. 8 p. 14).

Review.

A Study of Economic Depression in Rural Kistna. By Ch. Sitarama Sastry, M.A., L.T. and C. Sriramanarasimham, M. A. Published by the *Madras Provincial Co-operative Union*.

This Brochure is the result of investigations made by the authors in Kistna District with the aid of a grant of Rs. 600 made by the Andhra University for conducting the rural survey with the object of giving some practical training to research students in carrying such work. The land selected for the study is a Delta in which paddy naturally the most important crop occupying 50% of the total area of the District while in some of the villages in the Delta paddy occupies a very much higher percentage of area on the net cultivated area. Paddy is thus a commercial product of the tract. The costs of production have not very much changed, while the prices have fallen to a third of the prices that ruled in 1919-20. Being a fertile tract with a steady high income the standard of living of the agriculturists has been comparatively much higher than in other parts of the Presidency and when the prices went down precipitously, the agriculturists of this and similar delta tracts have been more severely hit than those in parts where dry or mixed famine prevails. It is not also possible to expect people who have long been accustomed to a high standard of living to suddenly change their habits, therefore the suffering is very much greater.

The authors suggest system and planning based on a detailed study of the various facts involved according to the unit of organisation and are of opinion that a start should be made with the villages as a unit and then extend the process of co-ordination to longer spheres and include various branches of production, agricultural and industrial.

Due to exceptional condition of irrigation and drainage the system of crop planning is most difficult in delta tracts, where the selection of crops is very largely restricted to paddy only in stiff soils with very little facilities for drainage, while in more favoured situations there is the possibility of raising crops like sugarcane, plantains and turmeric whose area cannot be very largely increased.

There are large areas of land in several districts like Salem, Coimbatore, N. Arcot, Chingleput etc., where paddy is cultivated at considerable expense, where other crops can be grown more profitably than paddy. If these tracts are not altered to compete in production and if the foreign import of rice is restricted, we hope that the price of paddy will increase and thus alleviate the sufferings of the delta ryots. The improvements effected by the introduction of better seed and methods of manuring and introduction of superior types of sugarcane all at the instance of the Agricultural Department have largely helped to increase the cultivators' margin of profit in this tract, which the authors do not seem to have noticed

K. R'chari.

College & Estate Notes.

Students' Corner. Examinations. The second terminal examinations were held between 9th and 11th December, practical examinations having been conducted during the previous week.

Tennis. The finals of Doubles handicap Tournament was played, between Moncy Joseph and Abdul Gaffoor vs. Herbert Adiseshiah and Sayeed which resulted in a victory for the former.

Cricket. In the Inter Collegiate cricket Tournament we played our first round against Government College on 20th November. Entering first the College piled up 214 for 7 and declared (Dinkar Rao 103 not out). Subsequently Government College made 56 the match ending in a victory for us.

The finals were played against Maharaja's College, Ernakulam on our grounds on 14th December. Visitors entering first fared badly and were all out for 29. Our College replied with 81 for 2, Albuquerque and Ramanadha Rao remaining unbeaten with 35 and 28. Thus the College won the Tournament for the south Zone. On 30th November Mr. K. Ramiah's wards met Mr. Sundararaman's and won by an innings and 41 runs.

The finals between Mr. K. Ramiah's wards and Mr. Narasimha Iyengar's ended in a victory for the former by 9 wickets and 14 runs. In both the innings D. V. Rajagopal the College bowler was responsible for 12 wickets thus passing his 100 wickets for the season.

Hockey. In the Inter Collegiate tournament our College won over Victoria College, Palghat in the first round by 6—1. The finals were played against Maharaja's College, Ernakulam at Alway which resulted in a victory for us (3—2) Rajagopal 2 and Sampath 1. First Hockey match for the victory cup was played between 1st and 2nd years, 1st years winning qualified for the finals and subsequently won the finals.

Foot-ball. The first match was played between second and third years former winning 1 to nil. In the finals first years won over the second years by 1 to nil. Thus the first years having won foot-ball and hockey qualified themselves as the holders of the cup.

Literary. Dr. C. Narasimhachary gave a talk on 'Rothamstead' to the members of the students club on the 18th inst.

Burma Agriculture. Under the auspices of the Union Mr. K. Ramiah, Paddy Specialist delivered an interesting lecture on Agriculture in Burma. Mr. R. C. Broadfoot, Principal, Agricultural College, presided on the occasion. A full report of the lecture will be published later.

The Officers' Club. The opening ceremony of the building extension and the celebration of the Annual Club Day, came off on the 23rd December. Rao Sahib C. V. Venugopal Pillai performed the opening ceremony. Mr. K. Krishnamurti Rao the President in his welcome address traced the history of the club from 1908, and gave an account of its steady progress from small beginnings to its present state. Mr. V. Gomatinayagam who was in charge of the construction, read the report of the building committee. A number of interesting items of Sports were gone through, and the function was a grand success, finishing off late at night after a dinner and variety entertainment.

Retirement. Mr. T. L. Lakshmana Rao, Asst Agri. Chemist, retired from service on Monday the 16th inst. The Officer's Club gave him a farewell tea on that date.

Visitors. Prof. Tanaka, of the Imperial University of Punna visited the College and Research Institute during the meeting. An account of the lecture he delivered at the College appears elsewhere.

Obituary. We regret to record the death of Mr K S. Viswanatha Iyer, Retired Assistant Agricultural Chemist, at his residence at R. S. Puram, Coimbatore on Thursday the 5th inst.

Crop and Trade Reports.

Cotton—Receipts of loose cotton at Presses and Spinning Mills.

Loose Cotton.	Bales as against an estimate of 445,600 bales.	Figures for corresponding period in previous year.	
1-2-35 to 8-11-35	423,826	551,391	
„ 15-11-35	428,217	556,062	
„ 22-11-35	434,633	561,308	
„ 29-11-35	439,078	566,675	
„ 6-12-35	444,279	570,340	
„ 13-12-35	449,631	575,302	
Pressed Cotton.	Receipt in Mills.	Export by Sea.	Import by Sea.
1-2-35 to 8-11-35	268,644	123,175	40,721
„ 15-11-35	272,117	124,136	41,346
„ 22-11-35	276,515	127,857	41,416
„ 29-11-35	279,126	128,817	42,480
„ 6-12-35	283,421	130,166	42,512
„ 13-12-35	286,131	132,532	43,127

(Bale 400 lbs.)

Cotton—Third forecast—1935-36. The average of the areas under cotton in the Madras Presidency during the five years ending 1933-34, has represented 9 per cent. of the total area under cotton in India. The area under cotton up to the 25th November 1935 is estimated at 2,204,300 acres. When compared with the area of 1,783,500 acres estimated for the corresponding period of last year, it reveals an increase of 23·6 per cent. The increase in area occurs in all the important districts outside East Godavari, Kistna and Madura. In the Deccan, the area rose from 797,000 acres to 1,169,000 acres owing to the favourable season and favourable price for cotton. The area under irrigated cotton mainly cambodia, is estimated at 206,700 acres as against 198,400 acres in the corresponding period of last year an increase of 4·2 per cent. Pickings of the early sown crop in Bellary are in progress and the yield is expected to be normal. The condition of the main crop throughout the Presidency is satisfactory. Normal yields are expected in all the districts. The seasonal factor for the Presidency works out to 100 per cent of the average as against 98 per cent in the previous year. On this basis, the total yield is estimated at 456,400 bales of 400 lb. lint as against 391,000 bales of last year, an increase of 16·7 per cent. The crop is young and it is too early to estimate the yield with any degree of accuracy.

The estimated area and yield under the several varieties are given below.

(Area in hundreds of acres, i.e. 00 being omitted, yield in hundreds of bales of 400 lb. lint, i.e. 00 being omitted.)

Variety.	Area from 1st April to 25th November		Corresponding yield	
	1935 (2)	1934 (3)	1935 (4)	1934 (5)
(1)	Acs.	Acs.	Bales.	Bales.
Irrigated cambodia	196,2	191,4	122,7	119,3
Dry cambodia	217,1	176,5	46,5	37,8
Total cambodia	413,3	367,9	169,2	157,1
Karunganni in Coimbatore	95,5	91,0	22,0	20,5
Uppam in the Central Districts	27,9	21,9	2,6	3,5
Nadam and Bourbon	2,6	20,4	1	11
Total, Salems	126,0	133,3	24,7	25,1

Tinnevellies *	344.0	330.0	88.6	84.9
Northerns and Westerns	1,169.0	797.0	146.2	95.8
Cocanadas	139.9	143.3	26.2	26.6
Others	12.1	12.0	1.5	1.5

* Includes Uppam, Karunganni and mixed country cotton in Madura, Ramnad and Tinnevely.

The local cotton trade is not generally active at this time of the year. The wholesale price of cotton lint per imperial maund of 82-2/7 lb. as reported from important markets towards the close of November 1935 was Rs. 20-7-0 for Cocanadas Rs. 23-7-0 for red Northerns, Rs. 19-6-0 for (early crop) Westerns, Rs. 28-11-0 for Cambodia, Rs. 27-5-0 for Coimbatore Karunganni, Rs. 26-1-0 for Tinnevely Karunganni, Rs. 25-1-0 for Tinnevellies and Rs. 24-8-0 for Nadam. When compared with the prices in the previous month, these prices reveal a rise of 7 per cent. in the case of westerns, 5 per cent. in the case of Cocanadas and 1 to 3 per cent. in the case of Cambodia, Coimbatore-Karunganni and Tinnevellies. The prices of red northerns, Tinnevely Karunganni and Nadam are stationary.

Paddy—Second forecast report—1935-36. The average of the areas under paddy in the Madras Presidency during the five years ending 1933-34, has represented 13.5 per cent of the total area under paddy in India. The area sown with paddy up to the 25th November 1935 is estimated at 9,597,000 acres. When compared with the area of 9,711,000 acres estimated for the corresponding period of the previous year, it reveals a decrease of 1.2 per cent. The decrease in area occurs in Ganjam, Vizagapatam, Kistna, Guntur, Kurnool, Chingleput, Salem, Coimbatore, Trichinopoly, Madura and Ramnad and is due mainly to the receipt of late and insufficient rains. The first crop has been generally harvested throughout the Presidency. Normal yields have been reported from all districts outside the Circars (Kistna excepted), Chingleput, Salem and South Kanara. In South Kanara, the yield is estimated to be slightly above normal. The seasonal factor for the Presidency works out at 95 per cent of the average as against 98 per cent in the corresponding period of the previous year. The wholesale price of paddy per Imperial maund of 82-2/7 lb. as reported from important markets towards the close of November 1935 was Rs. 3-2-0 in Cuddapah, Rs. 3 in Madura, Rs. 2-14-0 in Nellore, Rs. 2-12-0 in Vellore, Erode and Trichinopoly, Rs. 2-11-0 in Vizianagaram, Rs. 2-10-0 in Nandyal, Rs. 2-9-0 in Berhampore and ranged from Rs. 2 to 2-6-0 in the other markets. When compared with the prices reported for October 1935, these prices are stationary in Vizagapatam, Vellore, Cuddalore, Erode, Kumbakonam and Trichinopoly; they have risen by 14 per cent. in Berhampur, 4 per cent. in Negapatam and by 2 per cent. in Vizianagaram and are lower by 3 to 12 per cent. in the other markets.

Sugarcane Intermediate condition report—1935. The sugarcane crop was affected to some extent by drought in parts of Ganjam, Vizagapatam and East Godavari and by the Cyclone of November in Chingleput and Tanjore. In Kistna, the growth of the crop is not satisfactory for want of proper manuring and weeding. The condition of the crop is satisfactory in the other districts and the yield is expected to be normal if the season continues to be favourable. The wholesale price of Jaggery per imperial maund of 82-2/7 lb. as reported from important markets towards the close of November 1935 was Rs. 8-0-0 in Nandyal, Rs. 6-2-0 in Tuticorin, Rs. 5-15-0 in Kumbakonam, Rs. 5-12-0 in Bezvada and Masulipatam, Rs. 5-9-0 in Madura, Rs. 5-8-0 in Guntur, Rs. 5-6-0 in Bellary, Rs. 5-4-0 in Ellore and ranged from Rs. 4-6-0 to Rs. 4-13-0 in the other markets. When compared with the prices of the previous month, these prices reveal a fall of 15 per cent. in Rajahmundry, 11 per cent. in Vellore, 10 per cent. in Salem and 3 per cent. in Ellore and Guntur. The prices remained stationary in the other markets.

Weather Review (NOVEMBER 1935).

RAINFALL DATA

Division	Station	Actual for month	Departure from normal	Total since January 1st	Division	Station	Actual for month	Departure from normal	Total since January 1st
Circars	Gopalpore	0.0	-4.0	42.7	South	Negapatam	25.4	+8.7	54.8
	Berhampore*	0.0	-3.6	34.1		Aduthurai*	11.3	+1.7	33.2
	Calingapatam	0.0	-3.9	29.3		Madura	3.8	+1.1	25.1
	Vizagapatam	0.9	-2.9	18.6		Pamban	12.7	+0.7	33.3
	Anakapalli*	0.1	-3.5	22.2		Koilkpatti*	3.2	-3.6	18.5
	Samalkota*	0.0	-3.3	36.3		Palamkottah	5.9	-1.5	27.2
	Maruteru*	0.0	-5.1	33.6	West Coast	Trivandrum	8.4	+1.9	56.6
	Cocanada	0.0	-5.4	23.9		Cochin	4.3	-2.2	82.7
	Masulipatam	0.3	-5.4	32.7		Calicut	1.7	-3.7	102.5
	Guntur	0.0	-3.6	29.8		Pattambi*			
Ceded Dists.	Kurnool	0.0	-1.1	26.1		Taliparamba*			
	Nandyal*	0.0	-1.5	31.4	Mysore and Coorg	Kasargode*	1.5	2.6	145.6
	Hagari*	0.3	-1.4	22.0		Nileshwar*	2.0	-0.9	127.4
	Bellary	0.0	-2.2	20.0		Mangalore	0.1	-3.0	122.2
	Anantapur								
Carnatic	Cuddapah				Hills.	Chitaldrug	0.0	-2.3	25.8
	Nellore	1.4	-9.8	24.4		Bangalore	0.3	-2.6	42.8
	Madras	6.4	-7.9	37.9		Mysore	0.6	-1.9	39.5
	Palur*					Mercara	0.4	-2.8	121.0
	Palakuppam*	4.5	-5.6	29.7					
Central	Cuddalore	6.9	-8.2	33.6	Hills.	Kodaikanal	18.9	+10.0	73.1
	Vellore	3.5	-3.4	38.1		Coonoor	9.4	...	49.1
	Hosur cattle farm*					Ootacamund*	3.7	-0.6	34.7
	Salem	2.1	-1.7	30.6		Nanjanad*	2.1	-1.7	43.5
	Coimbatore	2.7	-1.1	14.5					
	Coimbatore Res. Inst.*								
	Trichinopoly	6.5	+0.9	33.5					

* Meteorological Stations of the Madras Agricultural Department.

Summary of Weather Conditions. Two Bay depression appeared during the month. The first one formed in the North Andaman sea on the 2nd with its centre near Lat. 14°N, Long. 94°E. This caused widespread rain in Lower Burma and moving to the Arakan coast, it began to weaken by the 4th November. Thunderstorms occurred during this period in Malabar and South East Madras.

A second Bay depression formed on the 11th east of Ceylon near Lat. 9½°N, Long. 87½°E which intensified into a storm off the Coromandal coast with its centre near Lat. 10°N, Long. 85°E on the 13th. Crossing the coast near Negapatam on the 15th, the storm traversed the Cauvery valley and moved into South-east Arabian sea off Malabar, on the 16th. Thereafter, moving away westwards, the depression became unimportant towards the 20th November. The storm caused widespread rain on November 14th, 15th and 16th in the South of Peninsula with locally heavy falls in South East Madras. Kodaikanal registering 13.6" of rain during the 24 hours ending at 8 hours on the 16th.

A few falls of rain occurred in South East Madras and Malabar during the rest of the month. Dry weather set in by the end of the month.

Rainfall was locally in excess at some places in South Madras and in large defect in all other parts of the Presidency.

Chief falls reported were :—

Negapatam	6'0"	on the 15th.
Kodaikanal	13'6"	} on the 16th.
Dindigul	7'2"	
Palani (Madura)	6'2"	
Tirupattur (Ramnad)	6'2"	
Viralimalai (Pudukkottah)	5'7"	} on the 17th.
Tattamangalam (Palghat)	10'3"	
Negapatam	8'0"	on the 22nd.

Weather Report for the Research Institute Observatory.

Report No. 11/35.

Absolute Maximum in shade	91°0'F.
Absolute Minimum in shade	59°8'F.
Mean Maximum in shade	86°1'F.
Departure from normal	+ 1°4'F.
Mean Minimum in shade	68°1'F.
Departure from normal	- 0°6'F.
Total Rainfall	32.27 inches.
Departure from normal	- 1'26 inches.
Heaviest fall in 24 hours	2.09 (Recorded on 16-11-35).
Total number of rainy days	3
Mean daily wind velocity	2.8 M. P. H.
Mean Humidity at 8 hours	74.2%
Departure from normal	- 7.1%
Total hours of Bright sunshine	194.3
Mean daily hours of Bright sunshine	6.5

Summary. Rainfall was in defect. The storm which moved over the South of the Peninsula caused a rainfall of 3 inches on the 16th and 17th instants.

A. S. R. & D. V. K.

Departmental Notifications.

Gazette Notifications. Mr. Y. G. Krishna Rao Naidu to be Deputy Director of Agriculture VI circle, Madura, Mr. Sadatullakhan to be Deputy Director IV circle, St. Thomas Mount, and Mr. K. Unnikrishna Menon to be Deputy Director III circle, Bellary; Mr. K. T. Bhandary to be Assistant Director of Agriculture VIII circle, Salem.

New appointments :—The following officiating appointments of Upper Subordinates—III Grade on Rs. 75 in the scale of Rs. 75—7½/2—105 in Class I, Madras Agricultural Subordinate Service are ordered with effect from 27th November 1935 : M. Kandaswamy, B. Sc. Ag. VIII circle, Coimbatore ; A. Shanmugasundaram, B. Sc. Ag., Livestock Research Station, Hosur; R. Alagiamanavalan, B. Sc. Ag., A. R. S. Palur; N. Sobhanadri, B. Sc. Ag., A. R. S. Guntur; P. Govinda Rao, B. Sc. Ag., as Assistant in Mycology, Coimbatore ; T. Ramanujulu Nayudu B. Sc. Ag., I circle, K. V. Chelapathi Rao, B. Sc. Ag., A. R. S. Samalkota; G. Venkatarathnam, B. Sc. Ag. Narasannapeta, for District work ; P. Sitharamaiah, B. Sc. Ag., Bhimavaram for training; G. Doraiswamy, B. Sc. Ag., as assistant in Paddy Section, A. R. S. Maruteru; K. V. Gaurangamurthi, B. Sc. Ag., Nellore for training in District, work ; S. Venkataramunappa, Officiating Farm Manager to officiate as Upper

Subordinate, Agricultural Section in the A. R. S. Kalahasti; K. Krishnamurthi, B. Sc. Ag., Narasipatam for District work; M. Srinivasa Rao, B. Sc. Ag., as Upper Subordinate, Agricultural Section to Anantapur for District work; K. Venkata Reddi Nayudu, B. Sc. Ag., to Tanuku for District work; C. Vadamalai, B. Sc. Ag. A. R. S., Palur; B. G. Narayana Menon, B. Sc. Ag., Asst. in Chemistry, Coimbatore; T. S. Dakshinamurthi, B. Sc. Ag., Fruit Research Station, Anantapur, Cuddapah District; S. Ananthan, B. Sc. Ag., Fieldman, Cotton Section as Assistant, Pempheres and Physiological Scheme (Botany Section)—under the Cotton Specialist, Coimbatore; A. Subrahmanyam, B. Sc. Ag., A. R. S. Samalkota; R. Subbayya Pillai, B. Sc. Ag., as Assistant in Millets, Coimbatore. B. Ramakrishna Reddi, B. Sc. Ag., to A. R. S. Nandyal; S. Krishnamurthi Rao, B. Sc., Dry Farming Station, Hagari; V. Srinivasan, B. Sc. Ag., to A. R. S., Aduturai; S. Muttuswami, B. Sc. Ag., VI circle, Madura; K. Govinda Kurup, B. Sc. Ag.: A. R. S. Nanjanad; D. Srinivasa Rao, B. Sc. Ag. A. R. S. Guntur; S. Krishnamurthi, B. Sc. Ag., Central Farm; G. C. Balanna, B. Sc. Ag. A. R. S. Nandyal; D. C. Hanumanta Rao, B. Sc. Ag., II Circle, Guntur.

Posting and transfers. Mr. A. M. Muthiah Nattan, A. D. Dindigal to Aruppukottai. Mr. S. P. Fernando, A. A. D. Aruppukottai to Dindigal. Mr. M. V. Kondala Rao, A. A. D. Chodavaram to ii circle to be A. A. D. Vinukonda. Mr. G. Sitharam Sastri, A. D. Vinukonda on return from leave to be F. M., A. R. S. Guntur. Mr. R. Guruswami Naidu offg. Assistant in the Millet Section, Coimbatore to iv Circle as A. D. Mr. S. Ramachandran, Assistant Maruteru to be Assistant, Paddy Section, Coimbatore. Mr. S. Narayaniah on reversion from the Madras Agricultural Service to be Assistant Lecturer in Agriculture, Agricultural College, Coimbatore. Mr. B. Shiva Rao, F. M. Guntur, to be A. D. i Circle. Mr. V. T. Subbiah Mudaliar, Assistant Lecturer, Agricultural College, Coimbatore to be F. M. Central Farm, Coimbatore. Mr. K. K. Raghavan F. M. Central Farm, Coimbatore to be A. D. Cuddalore. Mr. M. Ratnavelu, A. F. M. Central Farm Coimbatore to be A. A. D. St. Thomas Mount.

Leave. M. K. Ramanujachari A. D. Kandukur l. a. p. on M. C. for two months from 25—11—35.

ADDITIONS TO THE LIBRARY DURING JANUARY 1935.

A. Books.

1. Dictionary of Terms relating to Agriculture and Allied subjects. *Bezemer, T. J.* (1934). 2. The Pruning of Hardy Fruit Trees. *Dunkin, H.* (1934). 3. Physick Garden: Medicinal Plants. *Wheel Wright, E. G.* (1934). 4. The Organisation of Farming—Vol. I—Production. *Garratt, G. T.* (1930). 5. The Agricultural Register: A Record of Legislation, Organisation, Supplies and Prices. (England.) *Oxford Agri. Econ. Res. Inst. Pubn.* (1934). 6. Principles of Retailing. *Brisco, N. A.* (1927). 7. Cattle in the Tropics. *Wood, R. C.* (1934). 8. Feathered World Year Book. (1934). 9. Productive Poultry Husbandry. *Lewis, H. R.* (1928). 10. Poultry Ailments. *Blount, W. P.* (1934). 11. Internal Parasites of Domestic Animals. *Cameron, T. W. M.* (1934). 12. Veterinary Helminthology and Entomology. *Monning, H. O.* (1934). 13. Fleming's Veterinary Obstetrics—Revised, 4th Edn. *Craig, J. F.* (1930). 14. The Genetics of Garden Plants. *Crane, M. B. & Lawrence, W. J. C.* (1934). 15. Bombay Natural History Society—Jubilee Number. (1883—1933). (1934). 16. The Outlines of General Biology, Vols. I & II. *Thompson, J. A. & Geddes, P.* (1931). 17. Soil Analysis: Physical and Chemical Methods. *Wright, C. H.* (1934). 18. Volumetric Analysis. *Starck, H. P.* (1934). 19. Physical and Dynamical Meteorology. *Brunt, D.* (1934). 20. Statistical Abstract for British India (1922-'23 to 1931-'32). (1934).

B. Reports.

1. Season and Crop Reports of the Madras Presidency for 1933-'34. 2. Administration Report of the Madras Co-operative Societies (1933-'34). 3. Season and Crop Report of the United Provinces of Agra and Oudh for 1933-'34. 4. Annual Report of the Rice Research Officer, Burma for 1933-'34. 5. Proceedings of the Twenty-first Indian Science Congress—1934. 6. Report of the Rothamsted Experiment Station for 1933.

C. Special Publications.

7. Madras Agri. Dept. Villagers' Calendar (English Edn.)—1935. 8. Report of the Committee appointed by the Railway Board to report on the Suitability of the *Falkamesam Proservative* for treating timber—1934. 9. Survey of Oil Seeds and Vegetable Oils, Vol. III—Groundnut Products. *Eng. Imp. Econ. Comm. Stat. Pubn.* 2. (1934). 10. Report on Cattle Diseases. *Emp. Econ. Adv. Comm. Reports.* 11. Modern Changes in the Treatment of Light Soils. *Rothamsted Conference Pubn.* (1934). 12. The Bacteriological Examination of Water Supplies. 13. Report on the Bed-bug. *Eng. Min. Health Pubn.* 71, 72. (1934). 14. Five Years Experience of A. I. V. Fodder (in English). *Finland Valio. Lab. Cont. No. 2.* (1934). 15. Investigations into the Formation of Vitamins in Plants. (1933). 16. The Vernes Test for the Diagnosis of Tuberculosis in Dairy Cattle. *Reprint.* (1934). 17. High Temperature, Short time Pasturisation (Paper read before the World's 10th Dairy Congress). (1934). 18. Progeny Testing of Dairy Bulls. *Reprint.*

D. Bulletins, Memoirs &c.

19. Soil Deficiencies and Plant Diseases. *Imp. Bur. Soil. Sci. Tech. Comm.* 31. (1934). 20. Recent Research in Poultry Nutrition. *Imp. Bur. Ani. Nutr. Tech. Comm.* 5. (1934). 21. The Theoretical Significance of Vernalisation. *I. A. B. Herbage Pubn. Ser. Bull. No. 16.* (1934). 22. The Relation of Fertilizers to the Control of Cotton Root Rot in Texas. 23. The Pepper Weevil. 24. Storage of

Mill Cane. 25. Experiments with Nitrogen Fertilizers on Cotton Soils. *U. S. Agri. Dept. Tech. Bull. Nos. 426, 447, 449, 452.* (1934). 26. John's Disease of Cattle. 27. Farmers' Business Organizations in Canada. *Ottawa Agri. Dept. Bull. Nos. 167, 173.* (1934). 28. Studies in Phanerogamic Parasitism. *S. Africa Agri. Dept. Sci. Bull. 128.* 29. Prolonging Plowshare Service. *Idaho Agri. Exp. Stn. Bull. 202.* 30. Effects of Inbreeding on Fecundity in Rhode Island Reds. *Massachusetts Agri. Exp. Stn. Bull. No. 312.*

E. Circulars and Pamphlets.

31. "Malho" Disease in Mango Gardens in Sind and Its Treatment. *Sind Agri. Leaf. No. 40 (Horti. Ser.).* 32. The Purchase of Insecticides and Fungicides. 33. The Construction of Cow-Houses. *Eng. Min. Agri. & Fish. Adv. Leaf. Nos. 9, 82.* 34. The Commercial Ripening of Bananas. *Comm. Austr. Sci. & Indust. Res. Cir. No. 1.* 35. Methods of Re-establishing Buffalo Grass—on Cultivated land in the Great Plains. *U. S. Agri. Dept. Cir. No. 328.* 36. Agricultural Credit through the Farm Credit Administration. *Amer. Bankers' Assn. Ann. Meet. Address, 1934.* 37. Reopening Foreign Markets for Farm Products. *U. S. Agri. Dept. Pamphlet, 1934.* 38. Adjusting Cotton Production. 39. The Cotton Processing Tax. 40. Foreign Cotton Production and the American Markets abroad. 41. America's Cotton-Production Problem for 1935. *U. S. Agri. Dept. (Commodity Infn. Ser.) Cotton Leaf. Nos. 1, 2, 3, 4.*

F. Translations of Scientific Articles in Foreign Languages.

42. Belov (S. A.): Investigation on Pollination in Millet. 43. Kapshuk (A. A.): Bacteriological Study of Crown Gall of Fruit Trees. 44. Ivanoff (L. A.): Solar Radiation as an Ecological Factor.

ADDITIONS TO THE LIBRARY DURING FEBRUARY 1935

A. Books.

1. The New Agriculture. *Davis, K. C.* (1933).
2. Re-shaping Agriculture. *Willcox, O. W.* (1934).
3. Report on Coconut Enquiry in India. *Patel, J. S.* (1934).
4. Indian Tobacco and its preparations. *Indust. Book Depot Pub.* (1932).
5. The Sphere of Tea. *Ghosh, H. H.* (1933).
6. The Culture and Marketing of Tea. *Harler, C. R.* (1933).
7. Indian Sugar Industry. *Gandhi, M. P.* (1934).
8. The Care and Repair of Ornamental Trees. *Le Sueur, A. D. C.* (1934).
9. Colour in the Garden. *Stebbing, M. E.* (1934).
10. Agricultural Situation, (1932-'33). *Int. Instt. Agri. Rome.* (1934).
11. An Economic Survey of Gajju Chak : (A Village in the Punjab). *Dass, A.* (1934).
12. Breeding and Improvement of Farm Animals. *Rice, V. A.* (1934).
13. One-Man Poultry Farming. *Capper, A. H.* (1930).
14. Poultry Breeding. *Jull, M. A.* (1932).
15. The Gramineae—A Study of Cereal, Bamboo and Grass. *Agnes Arber.* (1934).
16. Evolution and Distribution of Flowering Plants, Vol. I—(Apocynaceae and Asclepiadaceae). *Macfarlane, J. M.* (1933).
17. Diametral Changes in Tree Trunks. *Haasis, F. W.* (1934).
18. Elements of Modern Biology. *Plunkett, C. R.* (1934).
19. Essentials of Zoology. *Meek, A. & Ganga Ram Kohli.* (1934).
20. Insect Physiology. *Wigglesworth, V. B.* (1934).
21. Entomology with Special Reference to its Ecological Aspects.—4th Edn. Revd. by *R. A. Wardle.* *Folsom, J. W.* (1934).
22. Chemistry of the Hormones. *Harrow, P. & Shervin.* (1934).
23. Official Year Book of Scientific and Learned Societies, England. (1934).
24. Engineering Workshop Manual. *Pull, E.* (1934).
25. The Drama of Weather. *Shaw, N.* (1934).
26. Earth Features and their Meaning.—2nd Edn., Revd. *Hobbs, W. H.* (1933).
27. Structure and Surface—A Book of Field Geology. *Brown, C. B. & Debenham, F.* (1929).
28. Adult Education in Practice. *Peers, R., Ed.* (1934).

B. Reports.

1. Annual Report of the Indian Lac Research Institute for 1933—1934.
2. Annual Report of the Royal Botanic Garden and the Gardens in Calcutta and of the Lloyd Botanic Garden, Darjeeling, for the year 1933—1934.
3. Annual Report of the Dept. Agri. and Stock, (Queensland) for the year 1933—1934.
4. British Guiana Agricultural Department Divisional Reports for the year 1933.
5. Stores Agri. Exp. Stn. Connecticut, Annual Report for 1932.
6. Florida Agri. Exp. Stn. Annual Report, for 1933.

C. Special Publications.

7. Studies of Variations in the Physical Properties of Cotton. *An Epitome of the Thesis for D. Sc., Dacca Univ., 1934.*
8. Agricultural Statistics of India (1931-32)—Vol. II, Indian States.
9. Statistical Statements relating to the Co-operative Movement in India, (1932-33). *Dept. Commer. Itell. & Statistics, India, 1934.*
10. List of Agri. Res. Workers in the British Empire for 1934. *Eng. Imp. Bur. Pubn. 1934.*
11. Silage Making in Mud-walled Towers. *Reprint from Vol. XI, No. 4, Emp. Cott. Grow. Rev.*

D. Bulletins.

12. Notes on Fruit Culture in the Hills.
13. Sundry Papers on Fruit Development, Fruit Growers' Organization and the necessity of improving the basis of Marketing. *Agra & Oudh Agri. Dept. Bull. Nos. 10, 11 (Fruit Ser.).*
14. Family Budgets (1932-'33) of Four Tenant-Cultivators in the Lyallpur District. *Punjab Board of Econ. Enq., Pub. No. 40.*
15. Experiments on in-breeding Poultry.
16. The Brown Rot Diseases of Fruit Trees. *Eng. Min. Agri. & Fish. Bull. Nos. 83, 88.*

17. Apple Pollination Studies in the Annapolis Valley, N. S., Canada (1928-'32).
 18. Cost of Producing Farm Crops in Eastern Canada. *Canada Agri. Dept. Bull. No. 162, 168 (New Ser.)*. 19. The effect of Arsenic, as used in Poisoning Grasshoppers, upon Birds. *Oklahoma Agri. Exp. Stn. Bull. No. 218*. 20. Results of Irrigation Treatments on Acala Cotton Grown in the Mesilla Valley, New Mexico. *New Mexico Agri. Exp. Stn. Bull. No. 220*. 21. Practices Relating to Control of Tobacco Mosaic. *North Carolina Agri. Exp. Stn. Bull. No. 297*. 22. Tomato Breeding. *North Dakota Agri. Exp. Stn. Bull. No. 276*. 23. An Index for rating the Agricultural Value of Soils. *California Agri. Exp. Stn. Bull. No. 556*. 24. Sandy Soils—Methods and Management. *Michigan Agri. Exp. Stn. Spl. Bull. No. 248*. 25. Cabbage Varieties. *Michigan Agri. Exp. Stn. Spl. Bull. No. 249 (Horti. Sec.)*. 26. Effect of Frequent Fires on Chemical Composition of Forest Soils in the Long Leaf Pine Region. 27. Studies on the Ring Spot Disease of Sugarcane. 28. Pectic Constituents of Citrus Fruits. *Florida Agri. Exp. Stn. Tech. Bull. Nos. 265, 267, 268*. 29. Studies in the Biology of *Phytophthora Infestans* (Mont.) De Bary. 30. Bottom Rot of Lettuce. 31. Methods Used in an Economic Study of Land Utilization in Tompkins County, New York, and in other similar studies in New York. 32. Vegetative and Reproductive Responses association with Fruit Development in the Cucumber. 33. An Economic Study of Grape Farms in Eastern United States: Part I—Production. 34. Soils in Relation to Fruit Growing in New York. *Cornell Agri. Exp. Stn. Memoir Nos. 153, 158, 160, 163, 605, 609*. 35. Studies of the Irrigation of Pear Orchards on Heavy Soil, near Medford, Oreg. 36. Application of Steam in the Sterilization of Soils. 37. Market Distribution of Car-lot shipments of Fruits and Vegetables in the United States. 38. Responses of Straw Berry Varieties and Species to Duration of the Daily Light Period. *U. States Agri. Dept. Tech. Bull. Nos. 432, 443, 445, 453*. 39. Treatment and Care of Tree Wounds. 40. Alfalfa Varieties in the United States. 41. Pea Diseases and Their Control. *U. States Agri. Dept. Farm Bull. Nos. 1726, 1731, 1735*. 42. Experimental Studies on the Development of Heavy Clay-pans in Soils. 43. The Physico-Chemical Properties of Soils affecting Soil Erosion. 44. Work of the Agricultural Experiment Station. 45. Factors Influencing hatchability in the Domestic Fowl. *Missouri Agri. Exp. Stn. Res. Bull. Nos. 210, 212, 340, 341*.

E. Circulars, Leaflets &c.

46. A Simple Method of Treating oat seed against Smut. *Bihar & Orissa Agri. Dept. Leaf. No. 4, 1934*. 47. Cover Crops (Agri. Ser.). 48. Green Manures (Agri. Ser.). 49. Fodder Grasses (Agri. Ser.). *S. S. & F. M. S. Agri. Leaf. Nos. 6, 7*. 50. Soybeans. 51. The Best Varieties of Grain. 52. Feeds and Feeding for Farm Livestock in the Maritime Provinces. *Canada Agri. Dept. Pamph. Nos. 155, 156, 158*. 53. Summer-Fallow. 54. Potato Culture. 55. Brooding and Chick Management. 56. Feeding for Milk Production. *North Dakota Agri. Exp. Stn. Cir. Nos. 54, 122, 123, 124*. 57. Influence of Spacing and Time of Planting on the Yield and Size of the Porto Rico Sweet Potato. *U. States Agri. Dept. Cir. No. 327*. 58. Poisoning of Livestock by Plants that Produce Hydrocyanic Acid. 59. Prevent Storage Rots of Sweet Potatoes. 60. The Barrel Seed Scarifier. *U. States Agri. Dept. Leaf. Nos. 88, 106, 107*.

List of New Periodicals added to the Library (From January, 1935).

1. Proceedings of the Indian Academy of Sciences, 2. Journal of Nutrition. 3. Physiological Reviews. 4. Journal of Chemical Education. 5. American Bee Journal. 6. British Bee Journal. 7. Bee Keepers' Record. 8. Proceedings of the Royal Society—Series B—Biological Sciences.

ADDITIONS TO THE LIBRARY, MARCH 1935

A. Books.

1. *Pioneers in Power Farming.* *Orwin, C. S.* (1934). 2. *Orange and Lemon Culture in India* *Lowrie, D. E.* (1934). 3. *Fruit Survey Report in Hyderabad State.* *Paranjpye, H. P. & Siddaramayya, M. P.* (1933). 4. *The Maintenance of Soil Fertility.* *Thorne, C. E.* (1930). 5. *Practical Transport Management.* *Hastie, A.* (1930). 6. *The History and Economics of Transport.* *Kirkaldy, A. W. & Evans, A. D.* (1931). 7. *Market Research: The Principles and Method of advertising Research and Market Analysis and their Scientific application to Sales Department.* *Simmat, A.* (1931). 8. *Economics of the Wholesale and Retail Trade.* *Stephenson, J.* (1929). 9. *Book Keeping—Part I, 4th Edn., Rev.* *Davar, D. R. & Pastakia, J. D.* (1934). 10. *Wisdom and Waste in the Pnnjab Village.* *Darling, M. L.* (1934). 11. *Scientific Research and Social Needs* *Huxley, J.* (1934). 12. *The Inheritance of Fecundity in Fowls.* *Smart, O.* (1932). 13. *Coccidia and Coccidiosis of Domesticated, Game and Laboratory Animals and of Man.* *Becker, E. R.* (1934). 14. *Tropical Fishes as Pets.* *Coates, C. W.* (1934). 15. *The Study of Geological Maps,—(Cambridge Series).* *Elles, G. L.* (1931). 16. *Useful Aspects of Geology,—(2nd Edn., Rev.).* *Shand, S. J.* (1934). 17. *On the Mineralogy of Sedimentary Rocks.* *Boswell, P. G. H.* (1933).

Reference Books.

18. *International Directory of Agricultural Institutions in Hot Countries.* (1934). 19. *International Directory of Animal Husbandry Institutions.* (1934). 20. *International Directory of Dairying Institutions.* (1934). 21. *International Directory of Agricultural Engineering Institutions.* (1934). 22. *The Concise Oxford French Dictionary.* *Chevalley, A. & Chevalley, M.* (1934). 23. *How to Learn Russian.* *Riola, H.* (1917). 24. *Russian-English,—and English-Russian Dictionary.* *Freese, J. H.* (1919). 25. *A Russian Manual of Self-Tuition.* *Freese, J. H. Ed.* (1919). 26. *Ivanoff's Russian Grammar.* *Gowan, W. E.* (1915). 27. *Russian Conversation Grammar with Key.* *Motti, P.* (1922). 28. *The League of Nation's Covenant.* *Sastry, K. R. R.* (1935).

B. Reports.

1. *Madras Agricultural Station Reports, 1933-'34.* 2. *India in 1932-'33.* 3. *Annual Report of the Imperial Council of Agricultural Research for 1933—1934.* 4. *Fourth Report showing the progress made in giving effect to the recommendations of the Royal Commission on Agriculture in India during the Calendar years 1932 and 1933. Part I—Central Government. Part II—Local Governments and Administrations.* 5. *Monthly Rainfall of India—1932.* 6. *Technological Reports on Standard Indian Cottons—1934.* 7. *Indian Central Cotton Committee Annual Report for 1933—1934.* 8. *Progress Reports from Experiment Stations of the Empire Cotton Growing Corporation—for 1933—1934.* 9. *Lancashire Indian Cotton Committee First Annual Report—1934.* 10. *South Australia Agricultural Department First Annual Report—1934.* 11. *United States Agri. Dept., Year Book of Agriculture, 1934.* 12. *New Jersey Agri. Exp. Stn., Annual Report for 1932—1933.* 13. *Illinois Agri. Exp. Stn. Annual Report, 1932—1933.* 14. *Wisconsin Agri. Exp. Stn. Annual Report, 1932—1933.* 15. *South Carolina Agri. Exp. Stn. Annual Report, 1933—1934.* 16. *Hawaii Agri. Exp. Stn. Annual Report, 1933.* 17. *New South Wales Agri. Dept. Livestock Diseases Report, 1933—34.*

C. Special Publications & Reports.

18. *Report on the Ceramic Survey of the Madras Presidency by D. Sundaravelu Pillai, 1934.* 19. *Functions and Organisations of the India Meteorological*

Department, 1935. 20. Cattle and Beef Survey. *Eng. Imp. Econ. Comm. Statistical Pub. No. 1, 1934.* 21. Agricultural Re-organisation and Price Control,—by R. L. Cohen. *Reprint from the Economics Journals, 1934.* 22. Agriculture and the State,—by R. R. Laird. *Jr. Scot. Agri. Coll. Vol. 15,—1934-1935.* 23. A Preliminary Review of the Field of Research in Eggs and Poultry. *Inst. Amer. Poultry Ind. Pub. 1934.*

D. Bulletins, Memoirs &c.

24. Seasonal Progress of Height Growth in Trees. 25. The Effect of Defoliation on the Increment of Teak Saplings. *Indian Forest Bull. Nos. 88, 89 (Silviculture Ser.).* 26. The Toxic Value of Derris SPP. S. S. & F. M. S. Agri. Dept. Pub. No. 16 (Sci. Ser.). 27. Diseases of Garden Plants and Fruit Trees in Mauritius. *Mauritius Agri. Dept. Bull. No. 43 (Gen. Ser.).* 28. A Short History of Tea Planting in Nyasaland. *Nyasaland Protect. Agri. Dept. Bull. No. 13 (New Ser.).* 29. The What and How of Hybrid Corn. *U. S. Agri. Dept. Farm. Bull. 1744.* 30. Cercospora Foot Rot of Winter Cereals. 31. Cotton Root Rot as affected by Crop Rotation and Tillage at San Antonio, Tex. 32. Agricultural Investigations at the Belle Fourche (S. DAK.). Field Station, 1926-1932. 33. Base Exchange and Related Properties of the Colloids of Soils from the Erosion Experiment Stations. *U. S. Agri. Dept. Tech. Bull. Nos. 428, 436, 456, 461.* 34. Citrus Culture in Hawaii. 35. Napier Grass (*Pennisetum purpureum*)—A pasture and Green Fodder Crop for Hawaii. 36. Cane Molasses as a Feed for Dairy Cows. *Hawaii Agri. Exp. Stn. Bull. Nos. 71, 72, 73.* 37. Permanent Pasture Studies on Upland Soils. *Alabama Agri. Exp. Stn. Bull. No. 243.* 38. The Use and Expense of Farm Implements. *Kentucky Agri. Exp. Stn. Bull. No. 345.* 39. Physiologic Factors affecting the Germination of Seed Corn. *Iowa Agri. Exp. Stn. Res. Bull. No. 176.* 40. Plant Association and Survival, and the Build-up of Moisture in Semi-Arid Soils. 41. Fundamental Concepts in Plant Research. *Arizona Agri. Exp. Stn. Tech. Bull. Nos. 53, 147.* 42. Acidity, Antacid Buffering, and Nutrient Content of Forest Litter in Relation to Humus and Soil. 43. Factors affecting the Development of the Cotyledonary Buds of the Common Bean, *Phaseolus Vulgaris*. 44. Studies of the Effects of Storage Temperature on the Propagation Value of Potato Tubers. *Cornell Univ. Agri. Exp. Stn. Memoir Nos. 166, 167, 168.* 45. The Sale of Cotton in the Seed in Oklahoma. 46. The Effect of the Ration on Wool Growth and on Certain Wool Characteristics. *Oklahoma Agri. Exp. Stn. Bull. Nos. 219, 220.* 47. Prices and Consumption of Milk in Specific Cities. *Illinois Agri. Exp. Stn. Cir. No. 418.* 48. Five Years' Results on Pasture Fertilization and Rotation Management. 49. Improving Pastures in New Jersey. 50. Some Observations on the Effect of Radio Waves on Insects and Plant Hosts. 51. The Principal Soils of New Jersey and their Utilization for Agriculture. 52. A Study of the Effect of Certain Ammonium Compounds on the Soil and on the Crop. 53. Derris Insecticides: I. Toxicity of Various Extracts of Derris Root to Sucking and Chewing Insects. II. Insecticidal Properties of Extracted Derris Root Residue. *New Jersey Agri. Exp. Stn. Bull. Nos. 564, 565, 568, 569, 571, 576.* 54. Fowl Pox Vaccination by the Stick Method. 55. Sewage Studies as Fertiliser. 56. Belts and Pulleys. 57. Pollution of Wells and Its Prevention. 58. Growing Egg Plants in New Jersey. 59. Common Ailments of Dairy Cattle. 60. Growing Peppers in New Jersey. *New Jersey Agri. Exp. Stn. Exten. Bull. Nos. 120, 125, 126, 127, 131, 132, 133.* 61. Three Important Leaf Spot Diseases of Sugarcane in Taiwan (Formosa). *Japan Taihoku Imp. Univ. Phytopathological Lab. Contributions, No. 27.* 62. Immunological Studies of Mosaic Diseases: IV. Effects of Acetone, Lead Sub-acetate Barium Hydroxide, Aluminium Hydroxide, Trypsin and Soils on the Antigenic Property of Tobacco Mosaic Juice. *Japan Taihoku Phytopathological Laboratory Contributions, 30.*

E. Circulars, Leaflets &c.

63. A Bund Forming Implement. 64. The Housefly Nuisance and Its Control with Maggot Traps. 65. Cotton. 66. A Pest of Stored Paddy. *Madras Agri. Dept. Leaf. Nos. 61, 64, 66, 65.* 67. Town Refuse as Manure. 68. Liquid Manure Tanks. 69. Chafer Beetles. *Eng. Min. Agri. & Fish. Advisory Leaf. Nos. 230, 232, 235.* 70. Better Sheep Management on Wisconsin Farms. *Wisconsin Agri. Exten. Ser. Cir. No. 270.* 71. Manufacture, Composition, and Utilization of Dairy By-products for Feed. *U. S. Agri. Dept. Cir. No. 329.* 72. Potato Improvement and New Varieties for Alberta. *Alberta Agri. Exten. Dept. Cir. No. 16.* 73. Specifications for Mosquito Oils and Larvicides. 74. The Bray Method for Available Potassium, applied to Soils of Known Potassium Treatment. 75. Vegetable Seed Disinfectants. 76. Feeding Dairy Cattle. 77. Ventilation of Poultry Houses. 78. Vegetable Plant Lice. 79. A Manual of Bee Husbandry. 80. Sheep Management. 81. Hydrocyanic Acid Gas Fumigation. 82. The European House Cricket. 83. Cat and Dog Fleas. 84. Interpreting Fertilizer Analyses with Reference to the Sources of Nitrogen. *New Jersey Agri. Exp. Stn. Cir. Nos. 291, 292, 299, 302, 306, 311, 317, 319, 326, 328, 329, 331.*

F. New Periodicals.

1. Cytologia. 2. Empire Journal of Experimental Agriculture. 3. Journal of Physical Chemistry.

ADDITIONS TO THE LIBRARY DURING APRIL 1935

A. Books.

1. Analysis of Manurial Experiments in India - 3 volumes. *Vaidyanathan, M.* (1934).
2. Field Studies in Ecology. *Brocher, R.* (1934).
3. Embryology and Genetics, *Morgan, T. H.* (1934).
4. Filterable Viruses. *Fairbrother, R. W.* (1934).
5. A Book about the Bee. *Mace, H.*
6. The Natural Organic Tannins. *Nierenstein, M.* (1934).
7. Civil Engineering Hand Book. *Urquhart, L. C.* (1934).
8. The Endless Quest: 3,000 years of Sciences. *Westaway, F. W.* (1934).

B. Reports.

1. Report on the Administration of the Department of Agriculture, United Provinces of Agra and Oudh for the year ending 30th June 1934.
2. Report on the Season and Crops of the North-west Frontier Province for the year 1933-34.
3. Season and Crop Report of Burma for the year ending the 30th June, 1934.
4. Kenya Colony and Protectorate Department of Agriculture Annual Report, 1933.
5. Annual Report of the Department of Agriculture, Sierra Leone for the year 1933.
6. Annual Report of the Department of Agriculture, Colony of Seychelles for the year 1933.
7. New York Agri. Experiment Station. Fifty-third Annual Report for the Fiscal year ended June 30, 1934.
8. Forty-fourth Annual Report Fiscal Year Ending June 30, 1933 of the Agri. Expt. Station of the Alabama Polytechnic Institute, Auburn.
9. Iowa Agri. Expt. Station Report on Agricultural Research for the Year Ending June 30, 1934.
10. Dominion of Canada Agricultural Department Report of the Dominion Agrostologist for the Years 1930 to 1933 inclusive.
11. Dominion of Canada Agri. Department Report of the Dominion Cerealists on Cereal work on Dominion Experimental Farms and Stations for the Years 1930-1933, inclusive.
12. Annual Report of the Department of Agriculture of the Province of Ontario, 1933.
13. Ontario Agri. Department, Sixty-fourth Annual Report of the Entomological Society of Ontario, 1933.

C. Bulletins, Memoirs etc.

14. Host Plant Index of Indo-ceylonese Coccidae. *Imp. Coun. of Agri. Res. Misc. Bull. No. 4*
15. A Note on Pine-apple. *U. P. of Agra. & Oudh. Agri. Dept. Bull. No. 9*
16. Green Peas. *England Min. of Agri. & Fish. Bull. Nos. 81, 34*
17. Mushroom-Growing. *England Min. of Agri. & Fish. Bull. Nos. 81, 34*
18. Soil Erosion.
19. Organic Manures, with Special reference to Composts. *Kenya Agri. Dep. Bull. Nos. 1, 9*
20. Lessons in Elementary Book-keeping for Co-operative Workers. *Gold Coast Agri. Dept. Bull. 29*
21. The Amount of Vitamin A Potency Required by Hens for Egg Production.
22. Growing Cotton Under Irrigation in the Wichita Valley of Texas.
23. The Vitamin A Requirements of Dairy Cows. *Texas Agri. Exp. Stn. Bull. Nos. 493, 494, 495*
24. Plants Poisonous to Livestock. *Wyoming Agri. Exp. Stn. Bull. 200*
25. Some Factors which Influence the Fruiting Habit of Henderson's Bush Lima Bean. *Ohio Agri. Exp. Stn. Bull. 535*
26. Groundwater Part I. Fundamental Principles Governing its Physical Control. *Utah Agri. Exp. Stn. Bull. 252*
27. Effect of Frequent Cutting and Nitrate Fertilization on the Growth Behavior and Relative Composition of Pasture Grasses. *Florida Agri. Exp. Stn. Bull. 269*
28. Growth and Development with Special Reference to Domestic Animals XXXIV. Basal Metabolism Endogenous Nitrogen, Creatinine and Neutral Sulphur Excretions as Functions of Body Weight.
29. The Structure of the Cow's Udder.
30. Pregnancy Disease in Sheep. *Missouri Agri. Exp. Stn. Res. Bull. Nos. 220, 344, 345*
31. Random Notes on Fruit Tree Root-stocks and Plant Propagation.
32. Zinc Oxide as a Seed and Soil Treatment for Damping-off. *New York*

Agri. Exp. Stn. Bull. Nos. 649, 650. 33. Physiological and Chemical Changes in Carrots During Growth and Storage. 34. A Physiological Study of Dormancy in Tilia Seed. *Cornell Agri. Exp. Stn. Mem.* 161, 169.

D. Circulars, Leaflets etc.

35. The House-sparrow. 36. Making Silage Without Buildings. *Eng. Min. of Agri. & Fish. Adv. Leaf.* Nos. 169, 243. 37. Field Practices Affecting the Control of Cotton Root Knot in Arizona. 38. The Rusts of Cereal Crops. *U. S. Agri. Dep. Cir.* Nos. 337, 341. 39. Starting the Orchard. *Missouri Agri. Exp. Stn. Cir.* 181. 40. The Production of Spring Vegetables in the Lower Rio Grande Valley. *Texas Agri. Exp. Stn. Cir.* 72. 41. Durable Whitewashes. *Florida Agri. Exp. Stn. Press Bull.* 468.

List of New Periodicals added to the Library during April 1935.

1. The Rice, Sugar and Coffee Journal. 2. Plant Science Literature. 3. Stylops. 4. Plant Physiology. 5. Scientific Horticulture. 6. Annual Statement of Seaborne Trade of British India. 7. Quarterly Review of Biology.

ADDITIONS TO THE LIBRARY

MAY, 1935

A. Books.

1. Tropical Soil Forming Processes and the Development of Tropical Soils with Special Reference to Java and Sumatra. Tr: by R. L. Pendleton. *Jul Mohr*, E. C. (1930). 2. The Genetic Classification and Mapping of Java Sugarcane Soils. *Pendleton, R. L. Tr:* (1931). 3. Mechanical Cultivation in India. *Wade, C. P. G.* (1935). 4. Firminger's Manual of Gardening for India (Rev.). *Burns, V., Revr.* (1930). 5. The Heritage of Cotton. *Crawford, M. D. C.* (1924). 6. Essentials of Systematic Pomology. *Drain, B. D.* (1925). 7. Efficient Marketing for Agriculture: Its Services, Methods and Agencies. *Macklin, T.* (1921). 8. Research in Sugar Problems and Utilisation of Bye-Products. *Gandhi, M. P.* (1934). 9. Rural Science in Tamil. 10. Cattle Breeding: Their Diseases and Cure (in Tamil). *Sittampalam, K. S.* (1934). 11. Flora of the Presidency of Madras—X—Gramineae. *Fischer, C. E. C.* (1934). 12. Reptilia and Amphibia—Vol. 2—Sauria: (Fauna of British India Series.) *Smith, M. A.* (1935). 13. Elementary Statistics. *Dubey, D. S. & Agarwal, S. L.* (1934). 14. A Guide to Electricity. *Smith, C. F.* (1934).

B. Reports.

1. North-West Frontier Province Agri. Dept. Annual Report for 1934. (1934). 2. Bombay Agri. Dept. Annual Report for 1933—1934. (1935). 3. Bihar and Orissa Agri. Dept. Annual Report for 1933—1934. (1935). 4. Nigeria Colony and Protectorate Agri. Dept. Annual Report for 1933. (1934). 5. Australia Commonwealth Agri. Dept. Council for Scientific and Industrial Research 8th Annual Report for 1934. (1935).

C. Special Publications.

6. Proceedings of the 5th Pacific Science Congress, 5 Vols. (1933). 7. Mysore Agricultural Calendar. (1935). 8. Co-operative Marketing by G. R. Pillai. (1934). 9. Directions for Cotton-Improvement in China by H. H. Love. (1934).

D. Bulletins, &c.

10. Report on the Export of Mangoes to Europe in 1932 and 1933. *Bom. Agri. Dep. Bull. 170, 1932.* 11. The Manufacture of White Sugar and Gul by the Open-pan Process. *Bom. Agri. Dep. Bull. 175, 1934.* 12. Some More Injurious Insect Pests of Crops. *Bengal Agri. Dep. Bull. 1, 1934.* 13. Some Common Fungoid Diseases of Crops and their Preventive Measures. *Bengal Agri. Dep. Bull. 3, 1935.* 14. Physiologic Specialization in Puccinia Coronata Avenae. 15. Boron in Soils and Irrigation Waters and its Effects on Plants with particular reference to the San Joaquin Valley of California. 16. A Method of Rural Land Classification. *U. S. Agri. Dept. Tech. Bull. Nos. 433, 448, 469, 1935.* 17. Market Diseases of Fruits and Vegetables—Apples, Pears, Quinces. *U. S. Agri. Dept. Misc. Pub. No. 168, 1933.* 18. Soil Blowing and Dust Storms. *U. S. Agri. Dept. Misc. Pub. No. 221, 1935.* 19. Subsistence—Farm Gardens. *U. S. Agri. Dept. Farmers' Bull. 1746, 1935.* 20. Crop Mixture Trials in Michigan. *Michigan A. E. S. Sp. Bull. No. 256, 1934.* 21. Irrigation Experiments with Prunes. 22. Some Effects of Thinning Orange Fruits. 23. Part-time Farming for Income. *California A. E. S. Bull. Nos. 573, 576, 581, 1934.* 24. Comparative Value of Legumes as Green Manures. *Hawaii A. E. S. Press Bull. 52, 1917.* 25. Crossing, Production and Exhibition, Rhode Island Reds. *Massachusetts A. E. S. Bull. No. 316, 1935.* 26. Description of Types of Principal American Varieties of Tomatoes. *U. S. Agri. Dept. Misc. Pubn. 160, 1933.*

E. Circulars, Leaflets &c.

27. Making of Poudrette from Night-Soil. *Madras Agri. Dept. Leaf. No. 67, 1935.* 28. Improved Strains of Rice for the Mallad Tract of the Bombay-Karnatik. 29. Dry Farming in the Deccan. *Bombay Agri. Dept. Leaf. Nos. 2, 4, 1934.* 30. Useful Agricultural Implements for Sind: E—The "Jenkins" Clod Breaker. *Sind Agri. Dept. Leaf. No. 45, 1935.* 31. A "Note" on "The Organisation of a Food and Vitamins Exhibition." *Bombay Baby & Health Week Association, Booklet No. 3, 1930.* 32. On Some Defects in the National Diet of India and How to Remedy them economically. 33. Soya Beans: Its Cultivation, Properties and Uses

Bombay Baby & Health Week Association, Pamphlet Nos. 6, 7, 1933. 34. "Balanced Diets". *Bombay Baby & Health Week Association, Pamphlet No. 8, 1935.* 35. Commercial Horticulture: Advice to Beginners. *Eng. Min. Agri. & Fish. Adv. Leaf. No. 236, 1935.* 36. Insects and Other Pests attacking Agricultural Crops. *California Agri. Exten. Ser. No. 87, 1934.*

JUNE 1935.

A. Books.

1. Fruit Tree and Grape Vine Pruning. *Quinn, G. (1932).* 2. The Grasses and Fodder Plants of New South Wales. *Breakwell, E. (1923).* 3. Agricultural Chemistry. *Sahasrabudhe, D. L. (1933).* 4. Planned Economy for India. *Visweswarayya, M. Sir. (1934).* 5. Indian Economics—Vols. 1 & 2 (7th Edition). *Kale, V. G. (1930).*

B. Reports.

1. Travancore Agri. Dept. Annual Report for 1109 M. E. 2. East Malling Res. Stn. Annual Report for 1934. 3. British Cotton Growing Association Annual Report for 1934. 4. Palestine Agri. Dept. Annual Report for 1934. 5. Straits Settlement—Botanic Gardens—Annual Report for 1934. 6. Jamaica Agri. Dept. Annual Report for 1933. 7. Mazoe Citrus Experiment Station Annual Report for 1933.

C. Special Publications.

8. Proceedings of the World's Grain Exhibition and Conference, Vol. 2. 9. Agriculture's Interest in America's World Trade. *U. S. Agri. Dept. Agri. Adjustment Administration Pubn. G. 10.* Land Utilisation. *Inst. Pacific Rel. Pub 11.* The Chief Preventible Blinding Diseases of Childhood by R. E. Wright. (1935). 12. Cotton Production in Southern Brazil. *U. S. Agri. Dept. Bur. Econ. F. S. 63.* 13. Sheep and Goats in Palestine. *Palestine Economic Soc. Pubn.*

D. Bulletins &c.

14. A Cattle Survey of the Rohtak District in the Punjab. *Board Econ. Inq. Pubn. No. 41.* 15. Combing of Good Quality Indian Cottons. *I. C. C. C. Technological Bull. No. A-27.* 16. Effect of Storage Prior to Ginning on the Spinning Quality of Cotton. *I. C. C. C. Technological Bull. No. B-19.* 17. Tree Fruits. 18. Variations in the Composition of Milk. *Eng. Min. Agr. & Fish. Bull. Nos. 2, 16.* 19. Studies on the Helminthosporium Root-Rot of Wheat and other Cereals. *N. S. Wales Agri. Dept. Sci. Bull. No. 47.* 20. Chemical Studies of Infertile Soils derived from Rocks high in magnesium and generally high in Chromium and Nickel. *U. S. Agri. Dept. Tech. Bull. No. 47.* 21. The Fellah's Farm. 22. The Transition to a Dairy Industry in Palestine. 23. The Movement of Colloidal Clay in Red Sandy Soils—a Factor Interfering with Normal Soil Properties. 24. Problems of Citrus Nutrition. *Palestine Agri. Exp. Stn. Bull. Nos. 10, 11, 13, 14.*

E. Circulars.

25. A Substitute for Dishorning. 26. Lime and its Uses on the Land. 27. Seed Testing. *En. Min. Agri. & Fish. Adv. Leaf. Nos. 226, 239, 247.* 28. Distance of Planting Rural New Yorker No. 2 and Triumph Potatoes as Affecting Yield, Hollow Heart, Growth Cracks, and Second-Growth Tubers. 29. Effect of Parboiling Rough Rice on Milling Quality. *U. S. Agri. Dept. Cir. Nos. 338, 340.* 30. Budding and Grafting. *Alberta Agri. Exten. Ser. Cir. No. 17.*

F. Reprints.

31. Physiological Phenomena at the Time of Flowering. By H. L. Van De Sande-Bakhuyzen. 32. The Growth Curve in Annual Plants—by H. L. Van De Sande-Bakhuyzen and Carl L. Alsberg. 33. A General Mathematical Theory of Depreciation by Harold Hotelling. 34. New Chinese Agricultural Statistics by M. K. Bennett. 35. The World Sugar Situation. 36. The World Rice Situation. 37. Some Economic Consequences of Commodity Control by Alsberg. 38. Prices of Farm Products by Joseph S. Davis.

ADDITIONS TO THE LIBRARY

JULY 1935

A. Books.

1. The Use of Fertilizers. *Barker, A. S.* 2. The Rose Encyclopaedia. *Henslow, T. G. W.* 3. Diseases of the Banana. *Wardlaw, C. W.* 4. Animal Nutrition (2nd Edition). *Wood, T. B.* 5. Fundamentals of Dairy Science, 2nd Edition (Rev.). *Rogers, L. A.* 6. Practical Butter Making: 7th Edn.—Rev., by D. V. Dearden. *Walker-Tisdale & Robinson, T. R.* 7. Proceedings of the 5th World Poultry Congress in 4 Vols., 1933. 8. Bee-keeping—New & Old—Vol. I (A Reference Book). *Herrod-Hemphsall, W.* 9. Swarming: Its Control and Prevention. *Snelgrove, L. E.* 10. Controlled Mating of Queen Bees. *Watson, L. R.* 11. A Thousand Answers to Bee-Keeping Questions. *Miller, C. C.* 12. Economic Plants. *Stanford, E. L.* 13. Organic Chemistry—(3 Vols.)—5th Edn. Rev. *Cohen, J. B.* 14. Organic Chemistry—Parts I & II, Rev. Edn. *Perkin & Kippings.* 15. The Nitrogen System of Compounds. *Franklin, E. C.* 16. A Manual of Entomological Equipment and Methods, Part I. *Peterson, H.* 17. Weather. *Free, E. C. & Hoke, T.* 18. Economics. *Smit's, A. H.* 19. The Study of Prices. *Layton & Crowther.* 20. Year Book of Agricultural Co-operation, 1935. *Horace Plunkett Foundation, Ed.* 21. Agricultural Co-operation in Fascist Italy. *Cotta, F.* 22. An Introduction to the Theory of Statistics—10th Edn. Rev. *Yule, G. U.* 23. Statistical Methods for Research Workers, 5th Edn. Rev. *Fisher, R. A.* 24. Bio-Mathematics—2nd Edn. Revised. *Feldman, W. M.* 25. Report of the British Association for the Advancement of Science, 1934. 26. The Indian Year Book—1935-'36. (Reference Book). 27. The Asylum Press Almanack and Directory of Madras and Southern India, 1935. 28. His Imperial Majesty The King Emperor and His Empire: A Pageant of Progress.

B. Reports.

1. England Imperial Agricultural Bureau—5th Annual Report of the Executive Council, 1933-'34. 2. Season and Crop Report of the Bombay Presidency, 1933-'34. 3. Cochin State Agricultural Department Annual Report, 1933-'34. 4. Nyasaland Agricultural Department Annual Report for 1934. 5. Puerto-Rico Agricultural Experiment Station Report for 1934.

C. Special Publications.

6. Review of the Literature on Pollination, Hour of Blooming and Natural Crossing in Rice,—by J. W. Jones. (1929). 7. Handbook of Official Grain Standards of the United States with Supplement. (1934). 8. Suggested Natural History Research on Habits and Culture of Bees in Missouri by A. C. Burrill. (1934) 9. Revised Rules and Regulations of the Secretary of Agriculture for Carrying out the Provisions of the Perishable Agricultural Commodities Act, 1930 (46 Stat. 531) as amended April 13, 1934 (48 Stat. 584). (1935). 10. Report of the Committee on the Improvement in the Marketing of Fruit and Vegetables in the Town of Bombay. (1935). 11. A Summary of the Important Results arrived at or Indicated by the Agricultural Stations in the United Provinces during 1933-'34. (1935). 12. Culture and Varieties of Siamese Pummelos as Related to Introductions into other Countries, by G. W. Groff. *Reprint from Lingnan Science Journal.*

D. Bulletins.

13. A Soil Survey of the Villages, Bern, &c., in South Australia. *Australian Commonwealth Coun. Sci. & Industr. Res. Bull.* 86. 14. Heavy Cotton Seed Meal, Feeding in Relation to Udder Troubles in Dairy Cows. *U. S. A. Tech. Bull.* 473, 1935. 15. Studies on Firmness and Keeping Quality of Certain Fruits. *Maryland Agri. Exp. Stn. Bull.* No. 366.

E. Circulars.

16. Contagious Bronchitis of Poultry (Infectious Laryngo-tracheitis). *England Min. Agri. & Fish. Adv. Leaf. No. 250*. 17. Lima Beans. *Alabama Polytech. Instt Agri. Exp. Stn. Leaf. 14*. 18. Variety Tests of Sugarcanes in Louisiana during 1932-'33. 19. Insect Parasites and Predators of Insect Pests. *U. S. Agri. Dept. Cir. Nos. 343, 346*. 20. Bunchy Top of Bananas. *N. S. Wales Agri. Dept. Plant Disease Leaf. 54*. 21. Preserving Vegetables. 22. Advice to Intending Growers of Bananas. *N. S. Wales Agri. Dept. Pubn. 1934*.

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A. Books.

1. Indian Sugar Industry—1935 Annual. *Gandhi, M. P.* 2. Co-operative Marketing of Agricultural Produce in South India. *Adinarayana Chetty, T.* 3. Bibliographia Genetica—Vol. XI., (i) Genetics of Zeamays: *Eryster, W. H.* (ii) Bastard Karyologie. *Bleier, H.* 4. The Fungi of Bombay (Bom. Agri. Dept. Bull. 176). *Uppal, B. N. etc.* 5. Practical Plant Anatomy. *Berkeley, G. J. A.* 6. Systematic Qualitative Analysis. *Caven, R. M.* 7. How to Treat Common Ailments of Farm Animals. 8. Handbook for Indian Students: A Guide to the Facilities for University and Professional Studies and Training in the United Kingdom. 9. The Indian Year Book (1935—1936). 10. The Year Book of the Universities of the Empire, 1935. 11. Official Year Book of the Commonwealth Australia, Vol. 27. 12. Agricultural Statistics of India, 1932-'33 (Vol. 1). (*N. B.* Items 9 to 12 are Reference Books).

B. Reports.

1. Mysore Agri. Dept. Coffee Scientific Officer, Ann. Report for 1934—1935. 2. Baluchistan Agency Administration Report, 1933—1934. 3. Ceylon Agri. Dept. Administration Report of the Director of Agriculture, 1933. 4. Canada Agri. Minister's Report, 1934. 5. Florida Agri. Exp. Stn Annual Report for 1934. 6. Oklahoma Agri. Exp. Stn. Director's Report for July 1932 to June 1934. 7. United States Agricultural Adjustment Administration Report for 1934. 8. Michigan Agri. Exp. Stn. Report for two years ended June 30, 1934. 9. Ontario Agri. Exp. Union, 56th Annual Report for 1934. 10. Ontario Agri. Dept. Vegetable Growers' Assn., 30th Annual Report for 1934. 11. Antigua Agri. Dept. Report for 1934.

C. Special Publications.

12. Pumps for Farm Water Supply. *Oxford Agri. Eng. Res. Pubn., 1934*. 13. Rice. *Jenkins, J. M., 1934*. 14. Cloud Forms: Definitions and Photographs. *Eng. Meteor. Pubn., 1934*. 15. Unofficial Meteorology—(Weather Studies No. 1). *Shaw, N. 1934*. 16. Krisheeva Vijayamu—(A Telugu Drama in 3 Acts). *Suryanarayana, M., 1935*.

D. Bulletins.

17. Trinidad Cotton Res. Stn. Memoirs, Ser. A., Genetics, No. 9, (a) Some Interspecific Hybrids in the Genus *Gossypium*; (b) A Hybrid between *G. Davidsonii* and *G. Sturtii*. 1935. 18. Trinidad Cotton Res. Stn. Memoirs, Ser. A., Genetics, No. 10, (a) Homologous Genes for Anthocyanin Pigmentation in New and Old World Cottons; (b) A Third Series of Experiments with the Crinkled Dwarf Mutant *G. barbadense* L.—the Cross *barbadense* crinkled × *hirsutum* crinkled; (c) The Inheritance of Brown Lint in New World Cottons. 1935. 19. Diseases of Cereal Crops in Kenya Colony. *Kenya Colony & Protect. Bull. No. 2, 1935*. 20. The Commoner Insect Pests of Orchards, Vegetable and Flower Gardens in Mauritius. *Mauritius Agri. Dept. Bull. No. 44, 1935*. 21. Further Investigations into the Transport of Bananas in Australia. *Australia Coun. Sci. & Industrial Res. Bull. No. 91, 1935*. 22. Generalities Concerning Farm Poultry. *S. Australia Agri.*

Dept. Bull. No. 297, 1934. 23. Some Notes in General on the Construction of Buildings. 24. Irrigation and Drainage. 25. Records of Some Departmental Work. *S. Australia Agri. Dept. Bull. Nos. 301, 303, 304, 1935.* 26. Cell Size and Structure in Plants as Affected by Various Inorganic Elements. *Vermont Agri. Univ. Bull. No. 383, 1934.* 27. Types of Farming in Illinois. *Ill. Agri. Exp. Stn. Bull. 403.* 28. The Influence of Crop Plants on those which Follow, IV. *Rhode Islands Agri. Exp. Stn. Bull. 243, 1934.* 29. Some Observations on 46 years of Ohio Weather. *Ohio Agri. Exp. Stn. Bull. 544, 1934.* 30. Rural Homes for Non-Agricultural Workers--A Survey of Their Agricultural Activities. *Ohio Agri. Exp. Stn. Bull. 547, 1935.* 31. Physiologic Specialization and Variation in Helminthosporium Gramineum Rab. 32. Morphological Relationships in the Ontogeny of the Cultivated Cucumber, (*Cucumis Sativus L.*). 33. Grape Growing in Minnesota. *Minnesota Agri. Exp. Stn. Tech. Bull. Nos. 95, 96, 297, 1934.* 34. Planning the Feeding of Farm Animals. *Mississippi Agri. Exp. Stn. Bull. 304, 1935.* 35. The Secretion of Milk and the Milking Process. *Missouri Univ. Agri. Exp. Stn. Bull. 346, 1935.* 36. History and Control of the Boll Weevil in Oklahoma. *Oklahoma Agri. Exp. Stn. Bull. 222, 1934.* 37. Studies of Nitrogen Fixation in Some Michigan Soils. 38. The Effect of Homogenization on Some of the Physical and Chemical Properties of Milk. *Mich. Agri. Exp. Stn. Tech. Bull. Nos. 143, 145, 1935.* 39. Organization of Farms in South Eastern Michigan. *Mich. Agri. Exp. Stn. Sp. Bull. 254, 1934.* 40. A Preliminary Report on Zinc Sulphate as a Corrective for Bronzing of Tung Trees. *Florida Agri. Exp. Stn. Bull. 273, 1934.* 41. Management of Dairy Cattle in Florida. 42. The Feeding Value and Nutritive Properties of Citrus By-Products. *Florida Agri. Exp. Stn. Bull. Nos. 274, 275, 1935.* 43. Economic Considerations in Marketing Fluid Milk. *Wisconsin Agri. Exp. Stn. Res. Bull. 125, 1934.* 44. How Farm Families Meet the Emergency. *Wisconsin Agri. Exp. Stn. Res. Bull. 126, 1935.* 45. Managing the Farm for Better Income. *Wisconsin Agri. Exp. Stn. Bull. 429, 1934.* 46. The Effects of Lime on the Hydrogen-Ion Concentration and Base Exchange Complex of Grundy Silt Loam. 47. A Production Method of Valuing Land. *Iowa Agri. Exp. Stn. Res. Bull. Nos. 178, 326, 1935.*

E. Circulars, Leaflets.

48. Utilization of Poultry Feathers. *Eng. Min. Agri. & Fish. Adv. Leaf. No 252, 1935.* 49. Thrips; Investigation: Some Common Thysanoptera in Australia. *Austr. Coun. Sci. & Indust. Res. Pamphlet No. 54, 1935.* 50. Potato Growing in Wisconsin. *Wisconsin Exten. Ser. Cir. No. 273, 1935.* 51. Cane Molasses (Blackstrap) as a Livestock Feed. *Missouri Agri. Exp. Stn. Cir. 184, 1935.*

F. English Translations of Scientific Articles (Official use only).

52. Observations on Some Wild and Cultivated Bananas by Aug. Chevalier. 53. The Consequences of Genetics for Plant Breeding by E. Baur. 54. The Physiology of Plant Development in Breeding Work, by T. D. Lyssenko. 55. Vernalization of Agricultural Plants in the Extreme North by V. Razumov & M. I. Smirnova.

ADDITIONS TO THE LIBRARY, SEPTEMBER, 1935

A. Books.

1. Soil Erosion : Bibliography. *Wieland, L. H.* (1935). 2. The Rice Directory and Manual, 1935. *Martinez, R. J.* (Ed.) (1935). 3. Crystallisation and Pan-boiling. *Mathot, A. L. C.* (1935). 4. Diseases of the Coconut Palm. *Varghese, M. K.* (1934). 5. Colloid Symposium—1934. *Weiser, A. B.* (1935). 6. Madras Public Works Dept. Code, 2nd Edn., corrected upto 31—3—1935. *Madras Govt. Pubn.* (1935).

B. Reports.

1. Mysore Agricultural Department Annual Report for 1933-'34. 2. Bengal Season and Crop Report for 1934-'35. 3. Bihar and Orissa Season and Crop Report for 1934-'35. 4. Punjab Agricultural Department Report for 1934. 5. United Provinces (Nagina) Rice Research Station Annual Report, 1933 to 1934. 6. Madras (Berhampore) Rice Research Stn. Annual Report for 1933-'34. 7. Bengal (Bankura and Chinsura) Rice Res. Stns. Annual Report, 1933-'34. 8. Central Provinces (Raipur) Rice Research Scheme Report, 1932-1934. 9. Burma Rice Research Officer Annual Report for 1934. 10. Rothamsted Experimental Stn. Report for 1934. 11. Jealott's Hill Agri. Res. Stn. Guide to Experiments, 1935. 12. Scotland (Hannah) Dairy Res. Instt. Annual Report for 1935. 13. Cyprus Agri. Deptt. Annual Report for 1934. 14. Connecticut (Storrs) Agri. Exp. Stn. 45th Annual Report for 1933. 15. Hong Kong Botanical and Forestry Deptt. Report for 1934. 16. Commonwealth of Australia Coun. Sci. and Indust. Res. 8th Ann. Report, 1934.

C. Special Publications.

17. Back to the Land—A Drama by S. Mahadeva Ayyar, Agri. Demonstr. Ariyalur. (1934). 18. Bombay Indian Central Cotton Committee 30th Meeting Summary Proceedings held on the 4th and 5th Febr., 1935. 19. Recent Developments in Soil Analysis. *Imp. Bur. Soil Sci. No. 10.* 20. Monthly Letter No. 10. *Imp. Bur. Soil Sci. Pubn.* 21. Publications relating to Soils and Fertilisers. *Imp. Bur. Soil List No. 50.* 22. Report on the Third Imperial Mycological Conference, England, 1934. 23. England International Congress for Scientific Management, 1935. 24. The World Sugar Situation. *Reprint from Foreign Crops & Markets, Aug. Issue, 1935.* 25. The World Rice Situation. *Reprint from Foreign Crops & Markets, Vol. 29, No. 27.* 26. Review of Results on Fertilisers for Rice. *Louisiana Agri. Exp. Stn. Pubn.* 27. An Interspecific Hybrid in Allium and Meiosis in Allium Fistulosum, Allium Cepa, and Their Hybrid. 28. Growth and Composition of Deglet Noor Dates in Relation to Water Injury. *Hilgardia Vol. 9, Nos. 5, 6.*

D. Bulletins.

29. Modern Mango Cultivation. *U. P. of Agra & Oudh Agri. Dept. Bull. No. 13 (Fruit Ser.) 1935.* 30. The Red Rot of Sugarcane. *U. P. of Agra & Oudh Agri. Dept. Bull. No. 66, 1933.* 31. Tea Soils. *Imp. Bur. of Soil Sci. Tech. Commn. No. 32, 1935.* 32. Sugarcane Variety Trials. *Trinidad & Tobago Agri. Dept. Pubn. Bull., 1934.* 33. Experiments in Egypt on the Interaction of Factors in Crop Growth : (A Preliminary Investigation of the Inter-relation of the Variety, Spacing, Nitrogen and Water supply with reference to Yields of Cotton. *Egypt Royal Aeri. Soc. Bull. 22 of Tech. Sec. and No. 1 of Royal Agri. Soc. & Imp. Chem. Indust., 1935.* 34. Rabies. *U. S. of Africa Bull. 150, 1935.* 35. Storage of Mill Cane. *U. States Agri. Dept. Tech. Bull. No. 449, 1934.* 36. The Acidity of Milk and Dairy Products

Wisconsin Agri. Exp. Stn. Res. Bull. No. 127, 1935. 37. Classification and Agricultural Value of New York Soils. 38. Marketing and Distribution of Certain Perishable Farm Products in the Lower Hudson Valley. *Cornell Univ. Agri. Exp. Stn. Bull. Nos. 619, 620, 1935.* 39. The Effect of Confinement Brooding on Growth and Egg Production. 40. Factors for Successful Farm Management in Todd, Christian and Warren Counties. 41. Studies of Frenching of Tobacco. 42. The Control of Fruit Pests. *Kentucky Agri. Exp. Stn. Bull. Nos. 346, 347, 349, 353, 1934.* 43. Investigations on Downy Mildew of Tobacco. *S. Carolina A. E. S. Bull. 303, 1935.* 44. Onions in the Connecticut Valley. *Massachusetts Agri. Exp. Stn. Bull. No. 318, 1935.* 45. Ecological Problems of the Humus Layer in the Forest. 46. Ionic Exchange of Peat Soils. 47. Certain Rare Elements in Soils and Fertilisers, and Their Role in Plant Growth. *Cornell Univ. A. E. S. Mem. 170, 172, 174*

E. Circulars, Leaflets &c.

48. The Selection, Preservation, Distribution, and Identification of Australian Pole Timbers. 49. Tests of the Efficacy of the Oxy-Acetylene Scouring and Charring Process for Sterilising Partly Decayed Poles. *Commonwealth of Australia Coun. Sci. & Industr. Res. Pamphlet Nos. 55, 57, 1935.* 50. The Disposal by Burial of Fruit Infested with Larvae of the Mexican Fruit Fly. 51. Economic Importance of Red Rot and Comparative Susceptibility of Some Sugarcane Varieties in the Southern United States. 52. Trapping Experiments for the Control of the Cigarette Beetle. *United States Agri. Dept. Cir. Nos. 349, 350, 356, 1935.* 53. Federal Land Bank Loans and Land Bank Commissioner's Loans: How and Where to Apply? *United States Farm Credit Admn. Cir. No. 1, 1935.* 54. Does Foreign Competition Hurt the American Farmer? *United States Agri. Adj. Admn. G. 38, 1935.* 55. Farm Family Diets in the South Carolina Piedmont. *S. Carolina A. E. S. Cir. 53.*

F. Reprints.

56. Onion Rusts of Japan: II. Bio-metrical Studies on Uredio and Telio, spores. 57. Bacterial Diseases of Plants Occurring in Taiwan (Formosa) V. 58. Bacteriophage in Relation to Bacterium Solanacearum: (i) Temperature Relation, Specificity, and Serological Reaction. 59. Hypochytrium Sasakii Shirai in Comparison with Corticum Stevensii Burt and Corticium Koleroga (Cooke) v. Hohn. *Taihoku Imp. Univ. Phytopathological Laboratory Contr. Nos. 23, 32, 34, 33.*

G. English Translations of Scientific Articles in Foreign Language.

60. The Potatoes of South America and Their Breeding Possibilities: Trans: by A. E. Trost. *I. C. A. R. Pubn.* (Extract from Suppl. 58 to Bull. of Applied Botany, 1933, Genetics and Plant Breeding, Published by the Instt. Plant Industry, Lenin Academy of Agri. Sci. U. S. S. R.).

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A. Books.

Biological Processes in Tropical Soils. Corbet, A. S. (1935). Bibliography of References to the Literature on the Minor Elements and Their Relation to the Science of Plant Nutrition. Willis, L. G. (1935). Classification of Wheat Varieties Grown in the United States. Clark, J. A. & Bayles, B. B. (1935). Gardening in East Africa. Jex-Blake, A. J. (1934). The Practical Fruiterer and Florist—3 volumes. Sheurn, W. B. (1935). Principles of Banana Breeding. Cheesman, E. E. (1934). Report on Agricultural Indebtedness. Sathyanathan, W. R. S. (1935). The Principles of Heredity. Snyder, L. H. (1935). Primitive Land Plants. Bower, F. O. (1935). Phytography as a Fine Art. Moll, J. W. (1934). A Text Book of Mycology. Bessey, E. A. (1935). The Meteorological Observers' Handbook. Eng. Air Ministry Meteorological Office Pubn. (1934). A Treatise on Surveying, Vol. I—5th Edn., Revd. Middleton, R. E. & Chadwick, O. (1935). Experimentation and applied Statistics for the Practical Agriculturist. Peterson, D. D. (1933). A Note on the Value of Correlation and Regression in Statistical Analysis. Peterson, D. D. (1934). Style Brief: A Guide for Authors in Preparing Manuscripts. Wistar Institute Pubn. (1934).

B. Reports.

Madras Agricultural Department Administration Reports of the Agricultural Chemist, Entomologist and Mycologist (Detailed) for 1934—1935. Report of the Agricultural Research Council, England for 1931-'33. Reports on the Work of Agricultural Research Institutes in the United Kingdom for 1932—1933. Uganda Agricultural Department Annual Report for 1934 (Part I). British Guiana Agricultural Department Annual Report for 1934. St. Kitts-Nevis Agricultural Department Annual Report for 1934. Grenada Agricultural Department Annual Report for 1934.

C. Special Publications.

Evaporation in India Calculated from other Meteorological Factors. Wind Data for Windmills. India Meteor. Dept., Sci. Notes Vols. 6/61, 6/63. Farm Wiring. Oxford Agri. Eng. Inst. Pubn. Review of Results on Fertilisers for Rice. Louisiana A. E. S. Pubn. Studies in Advancing Sterility: The State of Flowering known as Angiospermy. Hartley Bot. Lab. Pubn. The British Goat Society's Year Book for 1935.

D. Bulletins, &c.

Fibre Maturity in Relation to Fibre and Yarn Characteristics of Indian Cottons. I. C. C. C. Tech. Bull. (Ser. B) No. 20. Supply and Distribution of the Various Types of Indian Cotton during 1933-'34. I. C. C. C. Statis. Bull. 4. Trinidad Cotton Res. Stn. Memoirs, Ser. A., Genetics,—No. 11—Chromosome Numbers in the Malvaceae, I. Eng. Emp. Grow. Corp'n. Pub. A Method of Rural Land Classification. The Use of Carbon Disulphide Against the Japanese Beetle. Selenium Occurrence in Certain Soils in the United States with a Discussion of Related Topics. U. S. Agri. Deptt. Tech. Bull. Nos. 469, 478, 482. Spray-Residue Removal from Apples and Other Fruits. U. S. Agri. Deptt. Farm Bull. 1752. Grade, Staple Length, and Tenderability of Cotton in the United States 1928—1929 to 1932—1933. U. S. Agri. Deptt. Statistical Bull. 47. Solder. Internation. Tin. Res. & Dev. Council, Bull. 2. Some Factors Affecting the Influence of Soybeans, Oats and other Crops on the Succeeding Crop. West Virgin. A. E. S., Bull. No. 265. Improving the Uniformity of Cotton Fibre by the Use of the Pressley Sorter. Arizona

A. E. S. Tech. Bull. No. 54. Rural Homes for Non-Agricultural Workers—A Survey of their Agricultural Activities. *Ohio Agri. Exp. Stn. Bull. No. 547.* Life History and Migration of the Apple Woolly Aphis. *Virgin. Agri. Exp. Stn. Tech. Bull. 57.* Attitudes of High School Seniors Toward Farming and other Vocations. *South Carolina Agri. Exp. Stn. Bull. 302.* A Study for Economic Designs in Concrete for Culverts—Short Rural Bridges—Earth-Covered Arches and Retaining Walls, *Missouri Univ. Pubn. Tech. Ser. Vol 12/1.* Studies on the Critical Period for Applying Irrigation Water to Wheat. The Use of Sugar Beet Petioles as Indicators of Soil Fertility Needs. *Colorado Agri. Exp. Stn. Tech. Bull. Nos. 11, 14.* Construction of Irrigation Wells in Colorado. *Colorado Agri. Exp. Stn. Bull. No. 415.*

E. Circulars, Leaflets.

Crown Gall. *Eng. Min. Agri. & Fish. Adv. Leaf. No. 253.* Report on the Staple Length of the Indian Cotton Crop of 1934—1935 Season. *I. C. C. C. Statis. Leaf. No. 1.* An Apparatus for Adding Gypsum to Irrigation Water. Methods for Determining the Hydrogen-ion Concentration of Soils *U. S. Agri. Deptt. Cir. Nos. 38, 56.* The Drought and Current Farm Imports. *U. S. Agri. Deptt. A. A. A.—G-36.* Appraising Farms for Mortgage Loans. Selecting and Financing a Farm. *U. S. Agri. Deptt. Farm Credit Admn. Cir. Nos. 13, 14.*

F. New Periodicals.

The Indian Co-operative Review from January 1935.

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A. Books.

1. The Soya Bean. *Bowdidge, E.* 2. 9th International Horticultural Congress of 1930. 2(a). Proceedings of the American Society for Horticultural Science for 1933. 3 Apples and Pears. *Royal Horti. Soc. Pubn.* 4. The Pine Apple. *Johnson, M. O.* 5. Weeds. *Muenschner, W. C.* 6. The Cattle of the World. *Sanders, A. H.* 7. The Bombay Grasses. *Blatter, E. & McCann, C.* 8. Gymnosperms: Structure and Evolution. *Chamberlain, C. J.* 9. Plant Physiology. *Thomas, M. 10.* Translocation in Plants. *Curtis O. F.* 11. The Mechanism of Creative Evolution. *Hurst, C. C.* 12. Symposia on Quantitative Biology—2 volumes. 13. Biochemical Laboratory Methods. *Morrow, C. A. & Sandstrom, W. M.* 14. Colloid Chemistry. *Thomas, A. W.* 15. The Carbohydrates *Armstrong, E. F. & Armstrong, A. F.* 16. Manual of Biochemistry. *McClendon, J. F.* 17. Principles involved in Chemical Reactivity (Text Book of Physical Chemistry, Vol 2). *Friend, J. N.* 18. Controlled Humidity in Industry. *Marsh, M. C.* 19. A Veterinary Dictionary, 2nd Edn. *Miller, W. C., Ed.* 20. Helminth Parasites of the Domesticated Animals in India. *Bhale Rao, G. D.* 21. A Manual of Library Organisation. *Headicar, B. M.*

B. Reports.

1. Report of the Botanical Survey of India for 1933—1934. 2. Reports of the Research, Economic and Agricultural Education Branches of the Agri. Deptt.—S. S. & F. M. S. 3. North Borneo Agri. Deptt. Annual Report, 1934. 4. Gambia Agri. Deptt. Annual Report, 1934—1935.

C. Special Publications.

5. Notes on Tube Well Strainers used in the Punjab. *Punjab Agri. Deptt. Pubn., 1928.* 6. Immature Stages of Indian Coleoptera. *Indian Forest Records, Vol. I, Nos. I & IV, 1935.* 7. On the Biology of the Psyllidae. *Indian Forest Records, Vol. I, No. II, 1935.* 8. A Guide to the Cultivation of Bananas for Export. *St. Lucia Agri. Deptt. Pubn., 1934.*

D. Bulletins, Memoirs, Etc.

9. Field Experiments with Sugarcane, IV. *Br. Guiana Agri. Deptt. Sugar Bull. No. 4.* 10. Hardy Roses—Their Culture in Canada. *Canada Agri. Deptt. Bull. 17 (N. S.), Rev.* 11. Tobacco Growing in Canada. 12. Goat Husbandry in Canada. 13. Varietal Studies of Flue-cured, Burley and Dark Tobaccos. *Canada Agri. Deptt. Bull. Nos. 176, 177, 178 (N. S.).* 14. Effect of Alfalfa and Farm Manure on Yields of Irrigated Crops in the Great Plains. *U. S. Agri. Deptt. Tech. Bull. 483.* 15. Recommendations for the Control and Reclamation of Gullies. *Iowa Eng. Exp. Stn. Bull. No. 121.* 16. Pruning Bearing Apple Trees. *Massachusetts Agri. Exp. Stn. Bull. No. 320.* 17. Investigations on Downy Mildew of Tobacco. *South Carolina Agri. Exp. Stn. Bull. No. 303.*

E. Circulars, Leaflets, Etc.

18. List of Publications on Indian Entomology, 1933. *I. C. A. R. Misc. Bull. No. 5.* 19. Agricultural Implements *Punjab Agri. Dep. Leaf. No. 1.* 20. Insurance of Farming Stock against Fire. 21. Green Manuring. *Eng. Min. Agri. & Fish. Adv. Leaf. Nos. 101, 257.* 22. The Vegetable Garden. *Canada Agri. Deptt. Pamphlet No. 166 (N. S.).* 23. A Device for Separating Different Lengths of Fibres from Seed Cotton. 24. Safflower, A Possible New Oil Seed Crop for the Northern

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